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SPECIALIZED FOR EXPLORATION, DRILLING, PRODUCING, PIPE LINE OPERATIONS AND MANAGEMENT

JANUARY, 1954

What's Ahead in '54?

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Current Outlook Section

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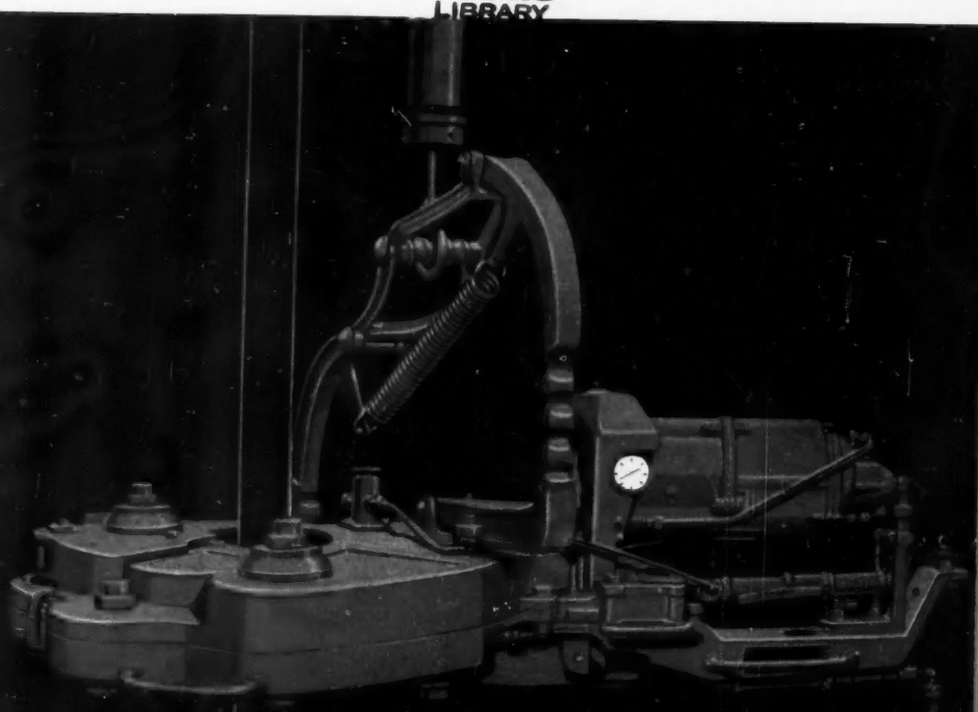

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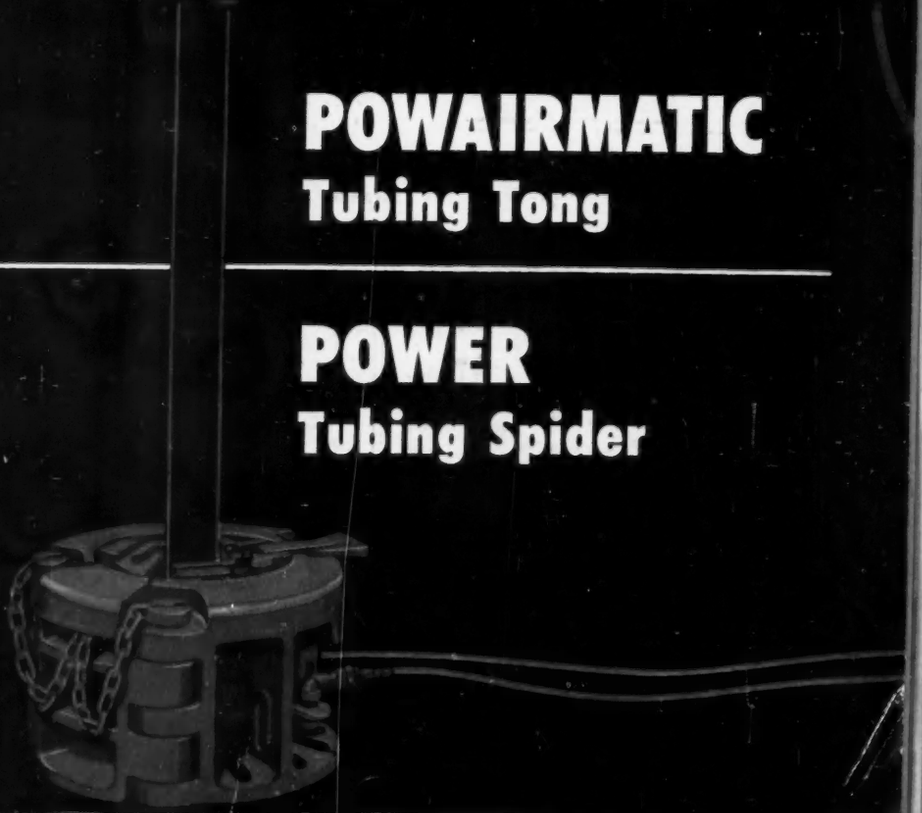
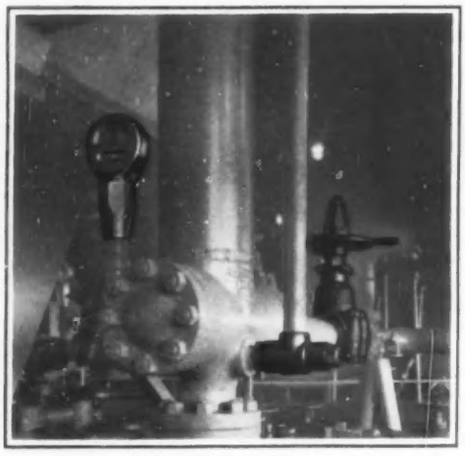


Tools of our Trade No. 7



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A Quick Look at This Issue

BUSY OIL MEN: To help you put first things first, scan these time-saving digests on this and the following pages, checking ☑ those you want to read first.

CURRENT OUTLOOK

☐ **Increases in consumption of petroleum products . . .** a new formation fracturing method . . . continued vigorous development in the Williston Basin . . . a slacking off in the inter-industry conflict over imports . . . an increase in U. S. operable refining capacity . . . electronic machines are here to stay. These are the topics covered in *Looking Ahead* . . . a quick look at timely topics affecting the oil industry. Turn to Page 39.

☐ **Future gas supplies endangered.** World Oil Editor Warren Baker takes a look at a rising threat to U. S. natural gas producers . . . government price regulation. On one side is governmental control, threat-

Turn the Page

A QUICK LOOK . . .

you're fired! . . .

☐ You don't, of course, use such harsh language, in dismissing an employe. But regardless of the language you use—whether it be discharge, terminate or release—the act will entail a lasting heartache unless you use a planned approach. To discharge an employe improperly is to invite repercussions in employe, community and customer relations. And why not give a little thought to the reasons. How could it have been prevented? The more intensive thought to causes for dismissals, the less there are likely to be. For some helpful hints on this painful problem, see **Page 51.**

ening future gas supplies. On the other side is a free market, creating a free market and sufficient competition among the thousands of oil operators to provide adequate supplies. What is the solution? See the *Editor's Page*, **Page 41.**

☐ **What's Ahead in '54?** A pressing need to alleviate the supply-demand imbalance confronts the industry as the new year begins. That is the thought uppermost in the minds of executives who participated in WORLD OIL's annual symposium on the challenges immediately ahead. All anticipate a period of steady growth. None are pessimistic. **Page 42.**

☐ **New legislation is imperative,** say oil and gas men, in view of the recent decision of the U. S. Supreme Court in the Phillips case. The decision indicates the FPC has power and responsibility of regulating wellhead price of natural gas. Such regulation will discourage the discovery and development of natural gas reserves. See **Page 45.**

☐ **Space, money and manpower are being saved** by the microfilming camera. The range of this machine has been broadened and it's now an important tool in a variety of operations. For just what it will do, see **Page 49.**

☐ **What's the demand outlook** for crude and natural gasoline in 1954? Domestic producers can expect a market for 1.1 percent more crude than they produced in 1953 and for 6.6 percent more natural gasoline and allied products. This is the forecast of the U. S. Bureau of Mines. It's based on the bureau's prediction that total demand for all oils will be 2.9 percent greater in 1954 than in 1953. Domestic production is due to rise 4.0 percent, but exports are due to drop almost 20 percent. See **Page 72.**

EXPLORATION ARTICLES

☐ **Prolific pools await discovery** along the eastern flank of the Anadarko Basin, especially in the area south of Oklahoma City, a comprehensive geological survey indicates. To find them operators will have to take advantage of seismograph surveys, aided by subsurface mapping and other geological techniques, such as electric log interpretation, correlation studies, recognition of stratigraphic relationships, structural and historical studies. Structures are not large, but are quite prolific. They include faults, anticlines, noses, and structural terraces. Stratigraphic traps are present, too. Multiple producing horizons are common. Operators have found it desirable to penetrate below the Wilcox and drill through the Simpson group of Ordovician age. See **Page 77.**

☐ **A successful exploration campaign** depends a great deal on proper planning. An operator must . . .

- Size up the area
- Choose the best method
- Estimate the cost
- Select the proper personnel

These are the basic steps in How to Plan an Exploration Campaign, the first of two-part article beginning on **Page 84.**

☐ **Well spotting made easier.** Necessity is still the mother of invention and when Fate Cupps, chief draftsman for Amerada Petroleum Corporation in Tulsa, faced a rush job with a short-handed staff, he invented a simple plastic drafting tool which saves time and assures greater accuracy. Designed especially

A QUICK LOOK . . .

for draftsmen and geologists, the tool spots wells, outlines leases and farms, and draws guide lines on maps in sectionalized country. And it does this in a third less time than with a regular scale, two triangles and a lettering guide. Turn to **Page 88.**

DRILLING ARTICLES

☐ **Ground walnut shells are being** used successfully as a bridging agent to combat lost circulation. Operators have reported that after regaining lost returns, it often has been possible to increase mud weights sufficiently to provide adequate safety margins for drilling into high-pressure zones without further mud loss. For a description of how the material is being used and specific examples of where the application has been successful, turn to **Page 105.**

☐ **The chemical treatment of drilling muds** has witnessed rapid advancements. The explanations of many peculiarities of mud behavior have been presented by three of our authors. Part I of this two-part article deals with the behavior of colloids, daily field tests on drilling muds, commonly used muds, and other important topics. **Page 107.**

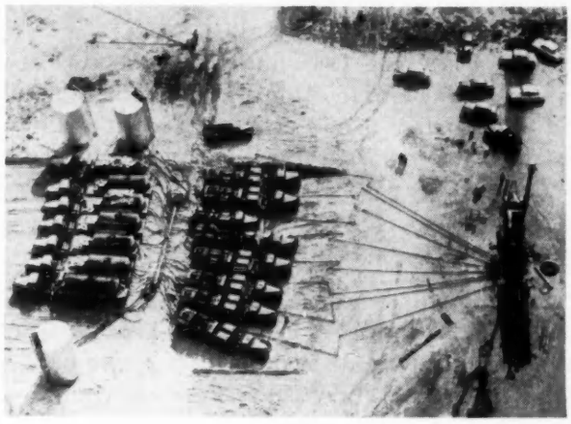
☐ **More about the weather**—Two more easy-to-decipher weather maps showing the expected temperatures across the U. S. in January and February. **Page 118.**

☐ **Gas drilling is a definite contribution** to the industry. It is enabling companies to reduce drilling time and cut costs. Although proven, many hazards go along with its use. Fire hazards and asphyxiation are big bugaboos. For an interesting discussion of the precautionary measures used by a company that has drilled more than 200 wells with gas, turn to **Page 121.**

☐ **Do you know what types of logs** to use under various conditions? L. A. Puzin continues his interesting discussion on *New Well Logging Developments* and offers a list of methods that will help in making the proper selections. It's the conclusion of a two-part article and begins on **Page 124.**

PRODUCTION ARTICLES

☐ **Where to shoot?** How much shot? How to tamp? These are but a few of the questions answered in *Shooting Water Input Wells.* It begins on **Page 160.** New types of explosives and improved techniques in well shooting have brought about higher injection rates for input wells in water-flooding. The author gives concrete suggestions based on almost 25 years experience in well shooting.



a new fracturing idea . . .

☐ . . . has been tried on Spraberry wells. And this rapid fracturing method shows promise of increasing production rates throughout this 100-mile long trend in West Texas. Injecting large volumes of refined oil at high rates down the open casing seems to be a step in the right direction in stimulating these tight, fractured formations. Results on 13 wells so far treated are included in *New Fracturing Idea Tried on Spraberry Wells,* **Page 153.** This article by WORLD OIL Production Editor J. E. Kastrop also includes a discussion of the operation —how it's done and what it takes.

☐ **Shut-in bottom-hole pressures** of normal gas wells in the Gulf Coast and southwest Texas areas can be estimated from a simple chart contained in *Estimating Gas Reservoir Pressure from Surface Data.* **Page 168.** Only data needed are: average producing depth, specific gravity of raw gas, and shut-in surface pressure. Approximate shut-in bottom hole pressures are extremely helpful in calculating data from which to construct back-pressure test curves to determine open-flow potentials of gas wells.

☐ **Cost of melting paraffin** in pumping wells has been cut by using hollow sucker rods. Hot oil is circulated down the rods to a point below the paraffin deposits, and then mixed with produced oil to elevate its temperature above that of the melting point of the wax. This is an innovation which has found wide use on the West Coast where operators find other uses for

A QUICK LOOK . . .

hollow sucker rods. Chemicals can be injected as well as many other uses to cut operating expenses in pumping wells. Details of this new idea and its applications are presented in *Hollow Sucker Rods Solve Paraffin Problems,* **Page 172.**

☐ **Planning to water-flood a limestone reservoir?** While not as desirable as sands for flooding, many limestone floods in the Tri-State area of Illinois Basin are paying off. What is the secret and how do they do it? Leon Krause, an outstanding water-flood engineer, outlines the techniques of several successful limestone floods. Several methods of injection are described and hints for cutting costs are given in *Flooding Limestones Can Be Profitable,* **Page 176.**

PIPE LINE ARTICLES

☐ **Born in the boom of 1909,** Lone Star Gas Company is one of the grand-daddies of modern gas transmission companies. It has provided key personnel to many other companies. And now 44 years later it is still growing. *The Map of the Month* and story on **Page 199.**

☐ **Keeping a line covered** with sandy backfill posed quite a problem for one company in Wyoming until an enterprising connection foreman wondered: "If snow fences make snow pile up, why wouldn't they do the same for sand." Barrels, sandbags, and battered bodies of old autos had failed to do the job. But for the story of just how the snow fences turned the trick, see **Page 204.**

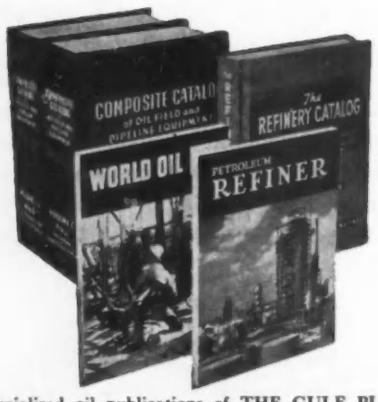
☐ **The first cross-country plastic pipe line** has been completed and is delivering crude from a producing field in the Williston Basin to a shipping point on the Great Northern Railway more than nine miles away. For a description of the line and pictures, turn to **Page 208.**

☐ **Determining the exact cut point** in pipe line batching has always presented a peculiar problem to the industry. Here's an article that describes a new device which does the job accurately and automatically by detecting the change in the dielectric properties of the pipe line fluids as the interface between batches moved down the line. See **Page 211.**

INTERNATIONAL ARTICLES

☐ **Burma's hand-dug oil wells** offer a contrast between the old and the new. The method still is being used in Burma, but it's a segment of the industry that's dirty, dangerous and dying. See **Page 225.**

☐ **Several discoveries of oil** have been made in Greece. But none have proven to be commercial production. Recently a new exploratory campaign was begun with the encouragement of the Foreign Operations Administration (formerly Mutual Security Agency) and the Green Hellenic Geological Institute. For an outline of some of the geological possibilities for commercial production in Greece, turn to **Page 230.**



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PETROLEUM REFINER and THE REFINERY CATALOG for the refining-natural gasoline-petrochemical industry.

RAY L. DUDLEY, President, Publisher
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Looking Ahead . . .

. . . **1954 will be a good year for the industry.** Not a year of boom, but of steady growth. A year posing new challenges to find new uses for petroleum that will utilize the growing quantities of crude in storage as the industry returns to normal. This is the opinion of industry leaders polled by WORLD OIL. (Page 42.)

. . . **Increases in daily average consumption of petroleum products** amounting to 300,000 barrels each year in U. S. and 250,000 abroad are in sight. Thus by 1963 U. S. demand will be 3,000,000 barrels a day greater than now and foreign demand will be up 2,500,000 daily, making world demand 5,500,000 barrels a day higher than now. This tremendous growth potential for the petroleum industry is foreseen by Sidney A. Swensrud, chairman, Gulf Oil Corporation. Capital expenditures for expansion and replacement of facilities will be greater, he thinks, than in any previous decade, despite heavy investment already existing. Percentage depletion as heretofore will be essential for expansion, he added.

. . . **A new formation fracturing method,** highly successful in 13 wells so far treated, may greatly stimulate production from Spraberry zone in West Texas. Wells averaging 33 barrels daily have yielded 183 daily for weeks after injections of 30,000 gallons of refined oil mixed with 45,000 pounds of sand through open casing at rates up to 66 barrels per minute. If higher production rates hold up well, a vast workover program and activation of many "shelved" locations may be encouraged in this ½ million acre trend. Service companies are hoping for resultant large volumes of work. Details of this promising new technique are given on Page 153.

. . . **Continued vigorous development in Williston Basin** is in prospect during the next several years. Though commercial oil and gas production was started 2½ years ago, many more wells will be needed to judge with certainty the full potential of the vast basin.

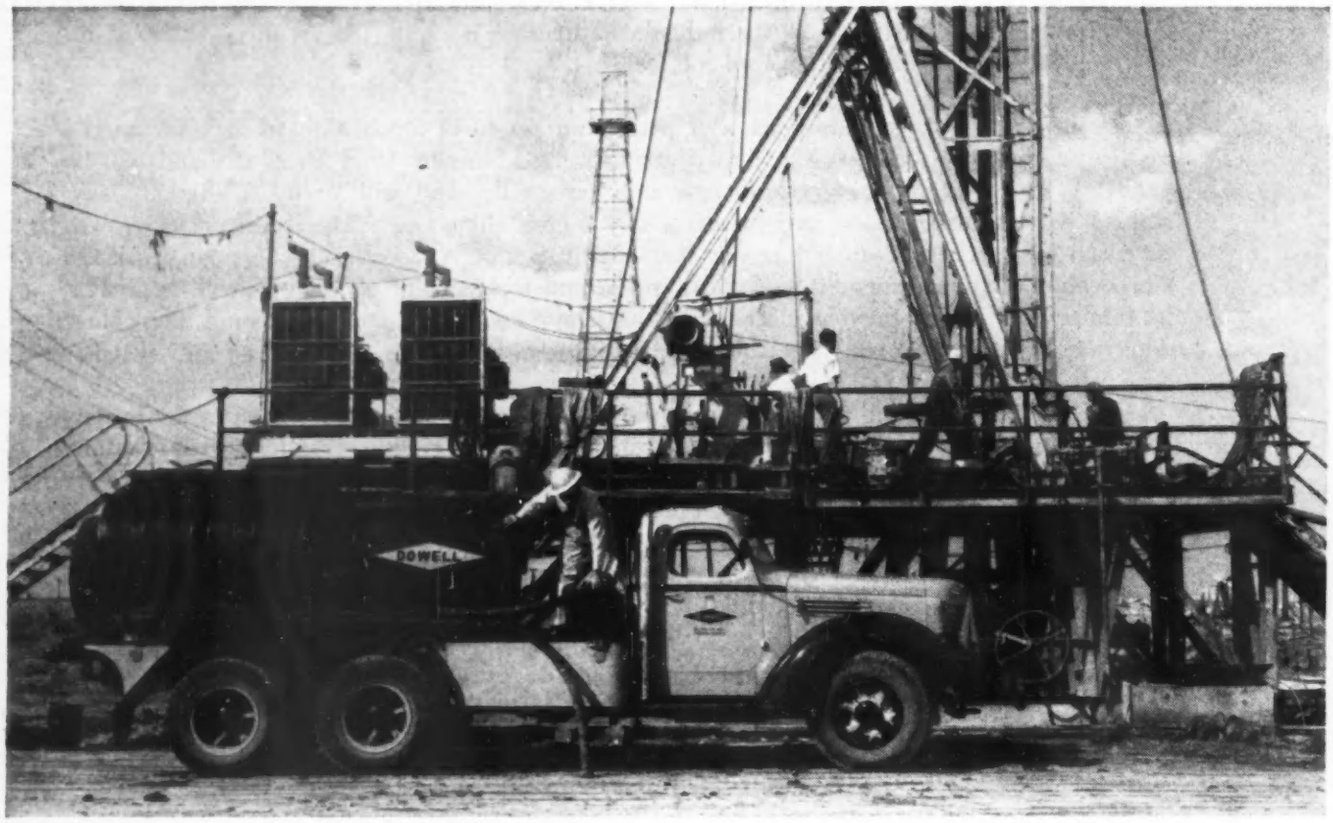
. . . **Inter-industry conflict over imports may be reduced** somewhat through current conciliatory moves of importing companies. Several have made headlines by public announcements that they were reducing their imports. Such announcements have come, for example, from Standard Oil Company of California, The Texas Company, and Gulf Oil Corporation. Opinion in the industry apparently is tending toward the view that the best way to handle the question of reasonable imports is through individual, voluntary action by the various companies, rather than through legislation, as threatened in some quarters.

. . . **U. S. operable refining capacity will increase by** 261,100 barrels daily in the first three quarters of 1954 to 8,339,900 daily September 30 from 8,078,800 at end of 1953. The capacity rose 494,000 daily during 1953 from about 7,585,000 at end of 1952. Recent and prospective increases by quarters have been estimated by API as follows: September 30, 1953, total 7,927,300 barrels daily; December 31, 1953, 8,078,800; March 31, 1954, 8,133,700; June 30, 1954, 8,297,600; September 30, 1954, 8,339,900.

. . . **Electronic machines are here to stay.** Small as well as large oil companies are advised to draw up plans for doing accounting, computing, and other office work by such machines, even though the plans may not be economical for immediate use. Plans should de-emphasize present costs of machines, as the costs eventually may be less than now. To gain economies of processing large volumes of transactions, companies may have to change recent trends of decentralizing paper work to branch offices and in the future bring the paper work into central data processing offices.

DOWELL MUD ACID OPENED UP CRITICAL ZONE

Well flowed 25 barrels of oil per hour after chemical treatment helped solve completion problem



Production suffers when the critical area of a well is blocked. Eliminating the blocking materials so that the well can flow freely often presents a major problem to oil producers.

Here's an answer! Dowell Mud Acid is a special acid solution that dissolves bentonite and similar silicate materials. It has been used successfully for many years to remove mud, mud cake, silicate materials and calcareous deposits from screens, slotted liners and formation pores.

Take the case of a well that was completed by perforating from 11,890 to 11,928 feet. It would not come in even after repeated washing and swabbing. Then, a Dowell Mud Acid treatment was recommended. Following the application of the Mud Acid, the well flowed 25 barrels per hour through a ¾-inch choke.

This is but one example. There are many others, where Dowell Mud Acid has spelled the difference between profit and loss. Results show that cement squeeze jobs are more often successful if Mud Acid is used ahead of the cement. And many operators use it to help free stuck drill pipe.

If you'd like to know more about Dowell Mud Acid, and if you're interested in learning more about Dowell's many other oil field products and services, be sure to contact your nearest Dowell office soon. Or, write directly to Tulsa, Dept. A-13.

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Future Gas Supplies Endangered

Government price regulation hangs heavy over U. S. natural gas producers today. The consequences of such regulation are many and far-reaching. All are bad and ill-advised when viewed from the long range viewpoint of both consumers and producers.

The threat springs from a recent U. S. Supreme Court affirmation of a Circuit Court of Appeals ruling. The decision was that under the Natural Gas Act the Federal Power Commission has jurisdiction over gas sold to interstate gas transmission companies for resale (State of Wisconsin vs. FPC, Nov. 30, 1953, in the so-called Phillips Petroleum Company case). Thus, it would appear, the FPC is obliged to regulate the field price received by producers.

Natural gas consumption has risen sharply in recent years. Current demand is double that of 1945, and still rising rapidly. This is because gas is much cheaper than its competitive fuels, coal and fuel oil. This makes it difficult to understand why consuming areas, like Wisconsin, would attack the industry which gives it cheaper fuel than it can find elsewhere.

•

Future gas supplies will be imperiled by government control of field prices. Sufficient supplies of gas to meet enlarged future demand depends upon an aggressive exploration search for new sources. Control of field prices will destroy the incentives to find and develop new gas reserves. Profit on successful ventures must necessarily be high to induce capital expenditures on such highly risky ventures, where eight of nine exploratory wells fail to find either oil or gas. These risks are too great to operate on fixed percentage investment returns.

Natural gas production cannot be regulated on a utility basis. Public utilities are protected against competition by franchises or certificates of convenience. They enjoy a fairly stable business with relatively fixed risks. On the other hand, natural gas production is highly competitive, the risks are great, and there is no assurance of investment returns. These are inherent factors, which cannot be changed.

In time, the regulation of gas producers would lead to an acute shortage. This would mean dire results for the thousands of industrial users and millions of home consumers. Through creation of insufficient supplies, because of destroying the incentive for seeking new gas fields, government control would lead to higher consumer prices.

On the other side of the picture, a free market would create sufficient competition among many thousand oil operators to provide adequate future supplies, and the latter would hold prices at reasonable levels. After all, production costs constitute but 10 to 15 percent of the price paid by consumers for gas. Transportation and distribution costs make up the remainder.

•

The solution lies in legislation which should be passed by Congress. Such a measure was enacted by Congress in 1950, but was vetoed by President Truman. Congress should expressly prevent the FPC from regulating the production and gathering of natural gas and also from regulating the price at which producers or gatherers sell gas to natural gas transmission companies.

This is essential for adequate future gas supplies, and therefore desirable for consumers and producers alike.

Warren L. Baker

What's Ahead in '54

Industry executives forecast period of steady growth and pressing need to alleviate the supply-demand imbalance.

THE INDUSTRY enters the new year with the pressing need to remedy its supply-demand imbalance.

This thought is uppermost in the minds of executives participating in WORLD OIL's annual symposium on the problems which will challenge the industry during 1954.

Government interference, public misunderstanding of the industry's problems and the continuing effort to reduce the depletion allowance are among the other problems cited.

All of the executives anticipate a period of steady growth. None foresees difficulties that cannot be resolved. The group's hopeful tone is typified by the conviction of T. S. Petersen, president of Standard Oil Company of California, that ". . . it is difficult to be pessimistic in this industry."

The executives' statements:

T. S. PETERSEN, President
Standard Oil Company of California

PETROLEUM HAS been one of the great growth industries in the U. S. Since the end of World War II domestic demand has increased an average of 6.8 percent each year, and in almost every year during that period the industry had to struggle to meet demand. In 1954 we should expect a more normal rate of growth if business activity can be sustained, perhaps 4 percent. Supplies should be adequate.

T. S. Petersen

It is the assurance of continuance in basic growth that permits the industry to expand capacity beyond current needs and thus provide the margin of safety so necessary during periods of emergency. It is also this growth trend that provides the vigor for which our industry is so well noted. New challenges continuously confront all segments of the industry to expand capacity and improve techniques.

Abroad, the outlook is much the same. Demands are increasing at a faster rate than in the U. S. (12 percent a year since 1946) and up to this year supply has been a problem. The prospective return of Iranian oil is the biggest question confronting the international oil industry.

It is dangerous to make predictions about the oil industry because unanticipated events can reverse the situation overnight. For example, deviations from normal weather will have an important effect upon the demand for heating oil. But for the long term it is difficult to be pessimistic in this industry.

•

REESE H. TAYLOR, President,
Union Oil Company of California

THE PROBLEMS of greatest concern to the Pacific Coast oil industry, and to the rest of the U. S. as well, are those resulting from excessive imports of crude oil. This flood of imports, if continued, will make it impossible for us to discover and develop an adequate supply of crude oil to meet civilian and military requirements. It will lead, in time, to a dependence on foreign oil which would jeopardize our country's security in the event of a national emergency.

Reese H. Taylor

As you no doubt remember, at this time last year we here on the Pacific Coast were greatly concerned about rigid ceiling prices preventing the industry from adequately supplying civilian and defense needs. The ceiling prices to which we were then limited did not provide sufficient incentive for discovery and development activity of the magnitude needed.

Now this situation has been corrected and we have sufficient price incentive for drilling. Unfortunately, however, some members of our Pacific Coast oil industry have seen fit to bring huge quantities of foreign oil far in excess of requirements into the West. Already, the resulting oversupply situation threatens our price structure.

The California oil industry is indeed at a critical point, and I am convinced that continuation of imports at these high levels can have *permanent* ill effects. We have a long history of supply below demand. During World War II the petroleum industry's difficulty in obtaining steel kept drilling activity considerably below what was needed to meet the greatly increased demand. After this, the postwar recession again discouraged drilling. Then price controls.

This year we have reached a point of transition. Supplies are adequate for our current needs and we have the price incentive to find and develop oil for our future needs.

The current high level of imports, resulting in great excess supplies, can only destroy incentives for domestic development. This in turn will lead to a gradual dependence on an outside supply from far-away lands. Not only does this place our West Coast oil industry in a perilous position from the standpoint of national defense, but there is simply no economic justification for it.

There is no good defense for a policy of importing higher cost crude oil from thousands of miles away while right here in the West we have the discovered and undiscovered reserves, the teams to explore, develop, and produce them, and the financial incentives for these activities.

Those responsible for excessive high imports are heedless of these arguments. They claim in self defense, "We've reached the turning point in the West—we're using our reserves up faster than we are discovering

them"—and so on. Actually, they have brought too much of their own foreign production into the U. S. in their haste to correct a local supply-demand imbalance.

Obviously, some foreign oil must come in to supplement domestic supply while we are in the process of increasing our known reserves. *But—it must not be imported in such quantity that it supplants existing production and destroys incentives for further development.*

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J. S. LEACH, Chairman,
The Texas Company

A FORMIDABLE SET of problems faces the industry as we enter 1954. However, in facing these problems squarely, there is good reason for us to look at them in a positive and affirmative manner as opportunities to clarify any misconceptions that may exist about the petroleum industry.

J. S. Leach

During the past year, American oil companies continued to suffer from attacks made upon them with respect to the unfounded "cartel" charges, the depletion tax allowances, price increases, and oil imports.

The last three issues in particular captured headlines. Those who wish to "regulate" our industry did not hesitate to pounce upon these issues and exploit them before the public.

The various elements in our business compete with each other, and the spur of that competition is a great stimulant to our efficiency. But our basic interests are not in conflict, they are the same interests. What helps the oil industry, helps us all; what hurts it, hurts us all alike. Our destiny is bound up in one package.

The problems that confront us now, whether in the domestic or the foreign field, are as serious as they have ever been. Their solution will demand all our ability, ingenuity and good will.

Two major studies of the nation's foreign trade policies are now under way by the Foreign Economic Policy Commission and by the Capehart Committee. At the same time other studies are going forward, such as the one headed by Senator George W. Malone on the availability of supplies of critical raw materials for an expanding economy and the security of the United States.

We have an opportunity, and an obligation, as an industry to do the best information job in our history. We must place before these study groups, as well as the public at large, the facts that will make it possible for them to understand fully the history and nature of American companies' participation in the foreign oil business and the special problems of operating in foreign countries. If they understand the facts, we then can hope for national policies which will enable the oil companies to continue to grow and increase their already major contributions to the country's progress and security.

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B. Brewster Jennings, President,
Socony-Vacuum Oil Company, Inc.

THE QUESTION is sometimes raised as to whether the oil industry is over built. We do not think so. We in Socony-Vacuum believe that an industry as vital as oil must be able always to supply consumers with what they need when they need it even if to do so means that at times some facilities are only partly used. It is not in the American tradition to expect consumers to take the shocks in fluctuation in demand.

B. Brewster Jennings

For companies in the oil business there is a big job ahead, with demand for oil likely to continue to rise. Though the percentage increase for 1954 over 1953 probably will be somewhat less than the average annual increase since World War II, the highest crude oil producing rate in the industry's history will be required this year to meet the demand.

L. F. McCOLLUM, President,
Continental Oil Company

THE YEAR 1953 completes a quarter of a century during which the demand for petroleum and its products increased at an average rate of better than 6 percent per annum. In the post-war era, the average rate of increase was better than 6½ percent per annum. There are but few industries in this country that have enjoyed a growth factor of this magnitude over a long period of time and that have been relatively immune to the fluctuations in the business cycle.

L. F. McCollum

The long-range outlook for the petroleum industry continues to be good. The dynamic nature of our economy requires consistently increasing volumes of energy fuels, and petroleum is indispensable in the pattern of this nation's energy requirements. The demand for petroleum and its products will continue to grow irrespective of the intermediate fluctuations in general business conditions. However, the rate of growth may not necessarily be quite as high as the one we have witnessed during the past 25 years.

As petroleum is a most valuable and irreplaceable natural resource, it is of great importance to the industry and to the nation as a whole that it be not wasted. Tremendous strides have been made in the conservation of oil and natural gas at production levels, but this is not where conservation should end. Petroleum products are bulky, inflammable and subject to high evaporation losses. Above-ground inventories which are substantially in excess of current requirements represent a wasteful practice from both an operating and economic viewpoint.

As we enter the new year, the petroleum industry is faced with one of the recurring periods of over-supply in crude oil and refined products, particularly in gasoline and distillate fuels. The over-accumulation of inventories in the latter two products was caused by a level of refinery operations which, since the early summer of this

year, have been consistently in excess of current and foreseeable future requirements. Prompt corrective action is needed and such action can be taken only if each refinery operator, large and small, takes an appraisal of his levels of stocks in relation to a carefully weighed and realistic forecast of future sales. The industry should become fully cognizant of the fact that with the standby facilities built up in the refining end, greater flexibility of operations and improved transportation facilities, there is no longer any need for carrying inventories of the magnitude considered necessary in the past.

Conditions of oversupply have occurred in the petroleum industry from time to time and have been always remedied through constructive approach to the problem by the many units which comprise the industry. It is only through such action that the present problem, which is clearly of a transitory nature, can be solved. Self-imposed restraints on the part of both refinery operators and companies importing crude oil are the key to the problem. In the long run, these measures are indispensable to prevent waste and to assure this nation an adequate supply of petroleum and its products at all times.

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K. S. ADAMS, Chairman, Phillips Petroleum Company

LIKE OTHER BUSINESSES, the oil industry seems always to be facing challenges to its efforts to provide abundant, economical supplies of products for the public. Usually these are resolved without too serious consequences. In WORLD OIL's forum a year ago, I stressed the necessity for adequate crude prices to stimulate an increased discovery rate of reserves to supply the growing normal needs of the future as well as provide an excess capacity for national emergencies. The crude price increase which became effective in June, although small in relation to increased costs of exploration and development, provided some stimulus.

K. S. Adams

Related to this are current problems which stem from meeting earlier requests of the government that the industry provide excess reserve producing and refining capacity for possible use during war emergency. It is obvious that this builtup increment of capacity, in which the industry has tied up large sums of money, cannot be regarded as an emergency reserve and at the same time be counted as a part of normal, everyday supply. Yet, paradoxically, this excess capacity is a very real threat to the adequate crude and product price structure necessary to support it. As long as the industry is required to provide this reserve it must find a way to live with it without overproducing. This poses a difficult problem particularly to the refining segment of the industry because of present antitrust laws.

Among the most important problems in connection with the balancing of supply and demand is that of oil imports. Foreign oil is a necessary supplement to our domestic supplies if we are to hold the excess producing capacity for an emergency. The real problem is to determine and adjust imports so that they do not discourage domestic discovery and development activities.

Problems arising from persistent efforts at government interference with the industry will no doubt continue in 1954. The most important of these are the threat of federal control of gas producers and recurring attacks upon the industry's percentage depletion allowance, both of which have vital bearing upon the provision of adequate petroleum reserves. The principal danger here, forcefully revealed during the Congressional investigation which followed the June crude oil and products price increases, lies in the lack of understanding outside the oil industry of the factors affecting its supply and prices. One of the industry's major problems is to create a better understanding of these factors by the general public.

Demand for domestic products in 1954 probably will be about 2.5 percent greater than in 1953. The industry should enter 1954 with a satisfactory inventory position if refinery runs remain at present levels and normal winter weather prevails.

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ROBERT G. DUNLOP, President, Sun Oil Company

THE CHALLENGE to the petroleum industry in 1954 is one of intensified competition with its consequent pressures toward higher quality and lower price.

Robert G. Dunlop

These requirements will demand greater efficiency in the operation of physical plants and equipment, higher skills in dealing with human beings to inspire wholehearted productive effort, and above all an unyielding resistance to schemes to thwart the functioning of the law of supply and demand in a free market.

The year 1954 will be, at the same time, a year of opportunity. It is out of vicissitudes and limitations that genius springs. The challenge here is to alertness and ingenuity in developing those new products, and in opening those new markets, that best solve problems of imbalance in supply and demand, and thus maintain the stability and continue the progress of the industry in adherence to true principles of competitive enterprise.

Characteristically, the petroleum industry has best served the interests of the American people during periods of greatest challenge. To the extent that the industry operates in an atmosphere of competitive principles and practices, a similar record of service will be achieved in the year 1954.

Court Approval of Price Fixing to Curb Gas Sales

• Supreme Court decision in Phillips case foreshadows FPC regulation of wellhead price of natural gas.

• Oil and gas industry men say prospective controls will discourage gas development and sales.

• Legislation to prohibit FPC regulation of producers urged.

OIL AND GAS producers' fears of being subjected to Federal Power Commission regulation on utility basis have proved well-founded, as evidenced by the decision of the U. S. Supreme Court November 30 in the Phillips case. The court held that FPC has the authority and responsibility of regulating prices received by natural gas producers from interstate pipe lines.

The decision upheld the ruling of the U. S. Court of Appeals for the District of Columbia that fixing of prices at the wellhead was within the jurisdiction of FPC.

The Court of Appeals had reversed the decision of FPC, which had found after lengthy hearings that it did not have the power to regulate Phillips Petroleum Company's sales of gas to a pipe line because Phillips was engaged only in producing and gathering gas and not in marketing it as a utility company.

The Appeals Court decision, as upheld by the Supreme Court, held that Phillips was a natural gas company "within the meaning of the Natural Gas Act and the commission (FPC) should fix rates at which these sales are made." The Court of Appeals had disagreed with the commission's opinion, which had stated: "Although technically consummated in interstate commerce, these sales are made during the course of production and gathering." The Court of Appeals apparently felt that the Phillips sales were made subsequent to "production and gathering."

The decision left some doubt, therefore, as to the view that the courts would take if the sales were made during or at the conclusion of "production and gathering." Twice in its decision, the Court of Appeals pointed out that the sales involved were after the completion of production and gathering.

Confusion Reigns. Meanwhile, the status of production and gathering under the Natural Gas Act is left in a confused state, and producers apparently are in greater danger than ever before of being subjected to utility type regulation if they sell their gas for delivery into interstate pipe lines.

Probably the most significant effect of the Supreme Court decision will be an immediate tightening up of supplies of natural gas for interstate movement. The interstate pipe lines will find it more difficult to find producers willing to sign contracts to supply gas to them. For such producers will run the risk of being declared subject to FPC regulation of the kind imposed on utilities.

The commission apparently could fix the prices received by the producer at the well and limit the profits of the producer to about six percent on his investment, as it does in the case of pipe line companies. The producers often are also producers of crude oil as well as gas, and they now fear that sales of gas to interstate pipe lines might result eventually in similar arbitrary fixing of prices of oil and limitation of profits on oil properties.

The seriousness of the court decision as it affects potential supplies of gas for the pipe lines is emphasized by the fact that large proportions of the nation's gas reserves are held by companies which are primarily oil producers and which will decline to sell their gas in the knowledge that such sales may bring down upon them crippling controls.

No Inducement. The gas utility companies themselves own relatively small gas reserves. They are discouraged from such ownership by FPC policy which has forced them to figure their own gas production at depreciated original cost instead of the going market price in rate making. There is no attractive inducement to a gas company to run the risks of developing gas reserves of its own, as any savings thereby made would be nullified by FPC adjustment of rates to prevent more than the customary return of about six percent on depreciated original investment. This policy of FPC is condemned by gas companies as preventing savings to the consumers, since owning of substantial reserves by a gas company would afford various advantages and economies. The gas companies have tried in vain to get FPC to allow them to figure the cost of their own gas the same as that which they buy from other producers.

The above discussed controls are the two great evils in present FPC regulation of the gas industry—the prospective fixing of producers' prices and the discrimination against gas companies' own production.

The Phillips case was taken into the courts by a group of municipalities and other political units, interested in regulating gas prices. The FPC decision in the case was appealed by the City of Detroit, City of Kansas City, City of Milwaukee, the State of Wisconsin and the Wisconsin Public Service Commission, and Wayne County, Michigan. FPC was defendant in the case, and intervening in behalf of the defendant were Phillips Petroleum Company and the states of New Mexico, Texas,

Amendment to Natural Gas Act in forthcoming Congress being discussed

Kansas, and Oklahoma, which asserted that federal regulation of gas production and sales would interfere with states' supervision of conservation programs.

Following the Supreme Court decision, Olin Culberson, member of the Texas Railroad Commission, said it was a "step in the wrong direction," doing "violence to the sovereignty of the state." He expressed doubt, however, that the outcome of the litigation would have much immediate effect on Texas conservation.

Congressional Action? In the wake of the decision, there was some talk of probable efforts to amend the Natural Gas Act in the forthcoming session of Congress, prohibting FPC regulation of gas production and gathering. However, no definite action toward this end had occurred at mid-December, and none seemed likely until after the beginning of the new year. There remained considerable doubt as to how far FPC could go in regulating gas production under the courts' interpretations of the existing law, since the conditions in other cases might be significantly different from those in the Phillips case.

During the latter part of the Truman administration, Congress passed the Kerr Bill, amending the Natural Gas Act to specifically exempt from FPC regulation the "arm's length" sales of gas by producers and gatherers to pipe line companies. But President Truman vetoed the bill, and efforts to over-ride the veto failed.

Whether or not a similar bill will be passed by Congress in 1954 is conjectural, and so is the question of whether such a bill would be allowed to become law by President Eisenhower.

The Kerr bill enactment and veto were attended by much clamor, and there was disseminated a great amount of propaganda that was prejudiced against the bill and its author, the Oklahoma senator, who was charged with wanting the legislation because of his own oil and gas production. Men of the oil and gas industries asserted in vain that the bill would be in the interest of the consumers as well as the producers of gas, and they still hold that view. Accordingly, it is to be expected that they will strongly support similar legislation which may henceforth be attempted.

Industry Opinion. Controls based on the Phillips case decision will make development of gas unprofitable and severely curtail its production, according to oil and gas men contacted by WORLD OIL.

It was the consensus that all owners of gas wells would endeavor as rapidly as possible to offer their gas to intrastate purchasers and that this would have the effect of automatically diminishing the supply of gas available for interstate pipe lines.

Those questioned predicted the decision would result in attempts to fix crude prices and to put oil and gas conservation under federal controls. They doubted if it would be possible to frame a bill that would satisfy both consumers and producers of gas. They said consumers had been badly misled and might never accept prices demanded by producers as essential.

some questions and answers . . .

FOLLOWING IS A more complete evaluation of the probable effects of the Supreme Court decision in the Phillips case upon the oil and gas industry, in the form of questions asked by WORLD OIL and answers as given by company officials.

Q—*What effect on future gas contracts will the recent ruling of the Supreme Court in the Phillips case have?*

A—There will be fewer new contracts made. There will be fewer extensions of existing contracts. It may be that some existing contracts will be cancelled pursuant to "escape clauses" providing for termination in the event the prices are regulated by federal authority. In all probability new contracts and renewal contracts will contain escape clauses. Prices may be higher to compensate for increased risks of regulation. A lot will depend upon availability of other sales or uses for the gas. Producers will be most reluctant to commit gas supplies to interstate pipe lines and will take less for their gas, where necessary, to obtain intrastate markets.

Q—*What effect will it have on the gas supply?*

A—The supply of gas for interstate markets will be reduced. There may be no reduction immediately, due to continuance of existing contracts, at least until actual regulation as distinguished from the threat of regulation takes place. But the rate of expansion which has taken place since World War II will decline markedly, not because the market is saturated, for it definitely is not, but because of the reluctance of producers to sell their gas to interstate pipe lines.

The field price of gas is but a small part of what consumers pay for the gas in distant states. Those who would trim by utility regulations the few cents received per thousand for gas in the field for the announced benefit of consumers in other states are misguided to say the least.

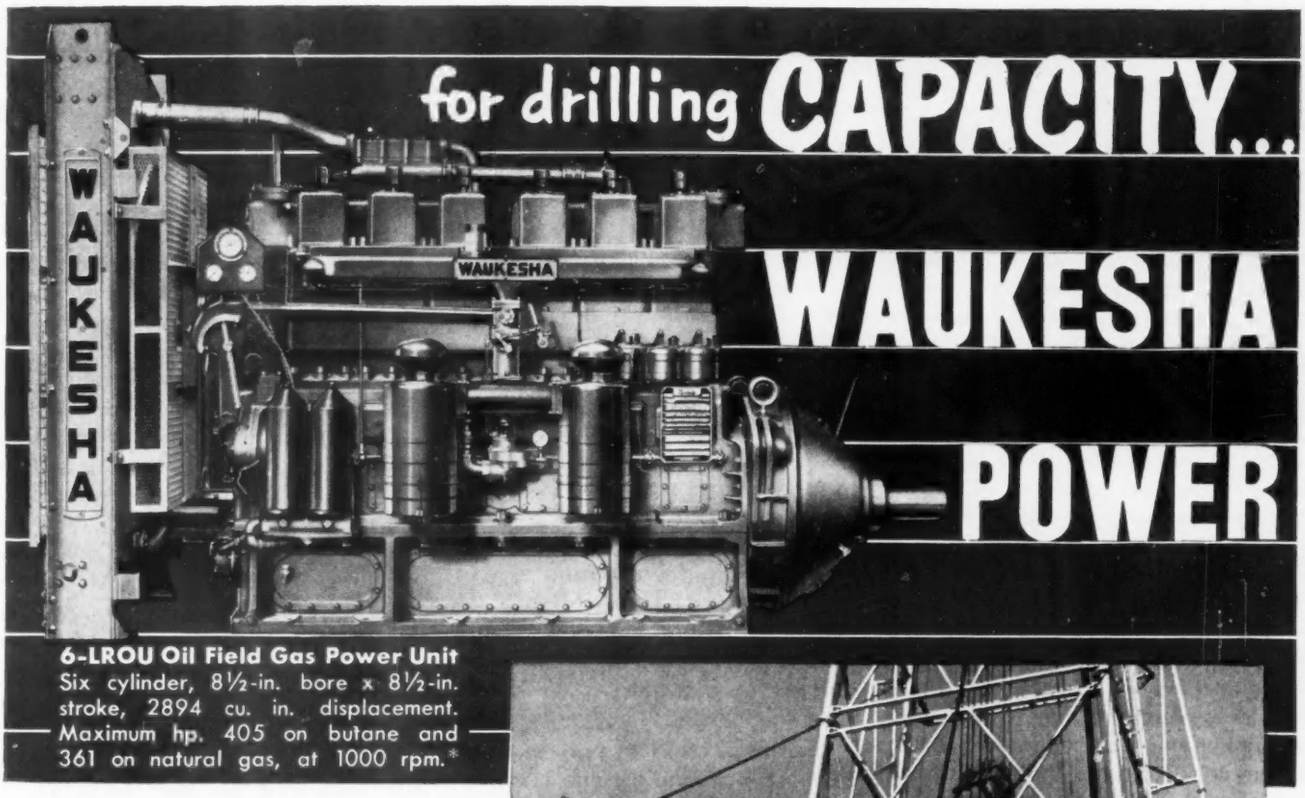
If successful, their actions will ultimately result in cutting off at its origin this best of all household fuels. It is certain that every effort will be made to sell the gas for use in the states where produced.

Q—*Do we see a possible threat that the government through FPC or any other agency will establish the price of crude: Is the present ruling a wedge toward price fixing generally (by the government, that is)?*

A—The regulation of field prices for gas will inevitably affect the production of oil. It is not conceivable that the FPC would undertake directly to regulate the price of oil under existing statutes. However, if Congress acquiesces in the construction of the Natural Gas Act by the Court of Appeals, it would seem that the same Congress might be inclined to regulate the price of other basic commodities by additional legislation.

There is no more reason to regulate the price of gas than to regulate other and more costly fuels, such as coal and oil.

Q—*What sort of bill do you (the company official) think will satisfy all*



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New *Oilwell* 76 rig shown has 3 Waukesha Giant Sixes. Bulletin 1560 tells *why*.

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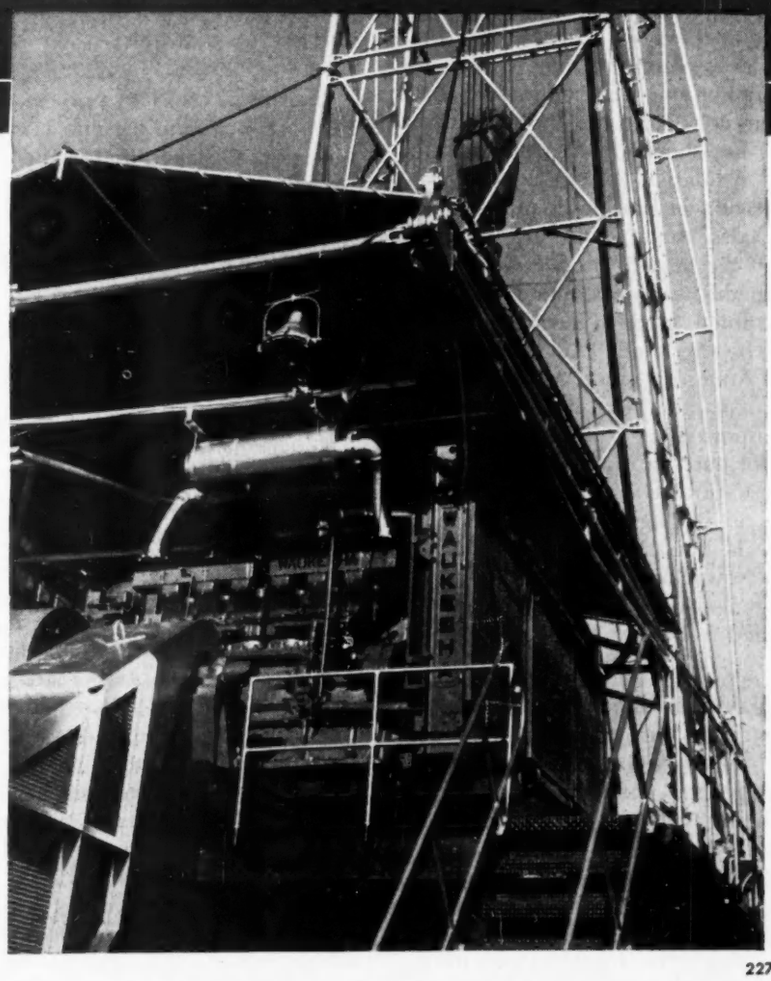

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parties? That is, the eastern customers, the producer.

A—It may not be possible to satisfy both the producers and the eastern consumers by legislation. It depends upon whether or not the consumers can be educated to think in terms of their long range benefit. Informed consumers must recognize that their greatest problem is adequate supplies of gas. As long as they pay less for gas than for coal on a heating unit basis, as they now do, they have no just complaint of the price. A competitive, unregulated producing industry is the best assurance of adequate supplies.

Therefore, Congress should provide by unequivocal language that cannot be misunderstood that FPC jurisdiction does not extend to the production or gathering of gas or to sales made upon conclusion of those functions. The act should make clear that federal regulation extends only to transportation in interstate commerce and to sales made after transportation from the field of production.

In this way, production will not be restrained and transportation only will be regulated. This will fit in with the American tradition of regulating transportation but not the products transported, e.g., railroads, pipe lines, motor buses, airlines, etc. That is what the Natural Gas Act was intended to do, as its legislative history clearly reveals, but the courts have messed it up. Now Congress should use clearer language to do what it originally intended to do.

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Legislation Urged. Following the Supreme Court decision in the Phillips case, Rex G. Baker, vice president and general counsel, Humble Oil & Refining Company, declared in a speech before the New Mexico Oil & Gas Association at Albuquerque that the present situation demands legislation by Congress. "This legislation should be aimed at two things," he said.

- "It should prevent the FPC from fixing or regulating the price at which the producer or gatherer of natural gas sells his gas to a natural gas company.
- "It should assure the natural gas company of an allowance for gas equal to the actual price paid where the gas is purchased at arm's length from non-affiliates, or the market price or fair and reasonable value in the field if the gas is produced by the company itself or is purchased from an affiliate.

"Legislation of this character is sorely needed in the best interest of all concerned," Baker asserted. "It will operate to free the production and gathering of gas from the uncertainties and hazards with which they have been surrounded within the past decade. It will encourage the risk of venture capital in the search for new gas reserves. It will reestablish a free market for natural gas, which in turn will assure consumers of abundant supplies at reasonable prices in the years to come."

Control of the field price of gas by FPC is contrary to the public interest, according to Baker, and would defeat the efforts of the gas and petroleum industry to provide gas for the future. A free market for natural gas is essential, he said, and controls such as those sought to be imposed on gas would logically lead to the regulation of the price of oil and competing fuels and from these controls to similar restraints upon all American industry.

Discussing probable consequences of the Phillips case decision, Baker said that apparently in other cases where sales are made after the completion of production and gathering, FPC may regulate the field price charged by the independent producer, and an attempt may be made to regulate the price received from sales made at the mouth of the well where gas moves interstate for resale. Added to this, he said, would be the control that the commission now exercises over the value at which natural gas companies take gas from their own producing properties into their trunk lines. These facts, he stated, have "created the need for Congress to legislate on the subject."

The legislation is needed, he explained, because it is unsound and not in the public interest to regulate the price received by the gas producer, and because it *is* in the best interest of the consuming public and the general welfare to remove the threat of FPC control. The legislation is needed, he further explained, for the following reasons:

1. Regulation of the production of natural gas and the price received in the field on a utility basis is wrong in principle, because natural gas production is a highly risk-taking venture, actively competitive, and completely different in character from a public utility business, with its assured profit. Risks in gas production are too great to secure exploration and development on the basis of a fixed percentage return on the investment in successful ventures.

2. Control of the field price of gas will destroy incentives to find and develop new gas reserves. A continuing supply of gas for the future depends upon finding new reserves, which in turn depends upon enlisting the resourcefulness and initiative of producers. No incentive will be provided if the industry is held to a utility return of 5½ to 6 percent on the cost of successful ventures.

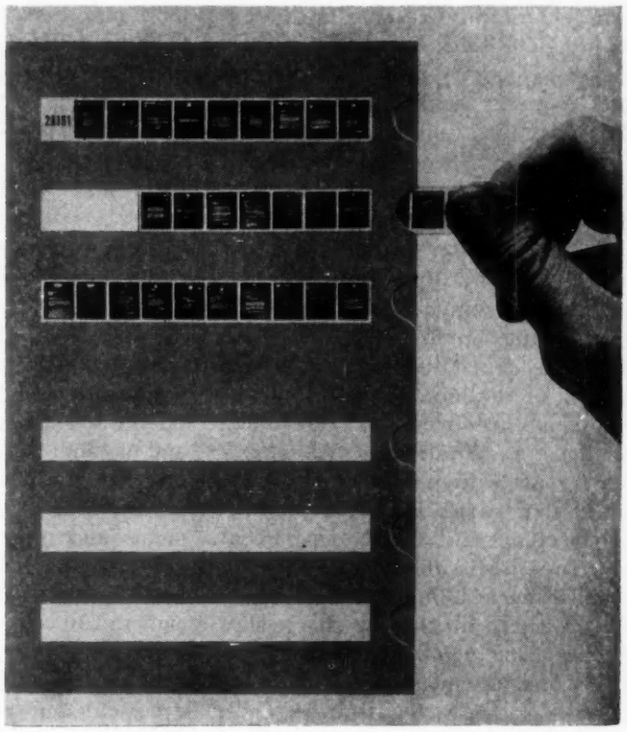
3. Government control of the producer's field price would in time mean higher prices to consumers. Shortages in gas supplies for interstate markets would occur, and they would mean higher costs of transportation and distribution and higher delivered prices.

4. Federal regulation of gas prices will impede gas conservation carried on by the producing states. Conservation of casinghead gas depends on the availability of markets at adequate prices. Expensive gas conservation facilities will not be built and gas will not be thereby saved in absence of a free, competitive market for the gas. Thus further investment in interstate gas pipe lines will be discouraged, and volumes of gas available to interstate markets will be reduced.

5. Controlling the field price of all gas moving interstate would be an impossible administrative task. FPC would have to deal with 4000 producers instead of 150 natural gas companies, and if it undertook to regulate all of them, it would require substantial new appropriations and face an appalling task of administration. Maddening delays and restrictions would be imposed upon producers.

—The End.

THIS MACHINE can photograph both sides of a document at the same time.



IMAGES ARE MOUNTED in a die cut card and sealed to protect the microfilm.

Save Space, Money and Manpower

The microfilming camera is no longer merely a space-saver . . . it's now an important tool in a wide range of office operations.

By EDWARD T. FREEL,
Remington Rand, Inc., New York City

ELEVEN OF the newest dual-lens microfilming cameras are doing a variety of record processing, filing and record retention jobs for a major Canadian oil company. The cameras are being used to produce current active records and for record filing and space-saving operations—from the producing and processing to the distribution and retailing levels.

Today's microfilming machines can

- Photograph most documents faster than operators can feed them.
- Count and stack the records.
- Provide their own identifying leaders and trailers.
- Make two identical copies in a single operation.
- Copy two sides at once.
- Select the right amount of film needed to photograph each document.
- Warn the operator when the film supply is exhausted.
- Stop automatically at first sign of trouble.

Some of the camera-handled paperwork procedures are basic elements of new systems developed for the oil industry; some are variations on high-speed, work-saving techniques common to airlines, railroads and interstate bus companies; others are adaptations of personnel record operations and of credit and invoicing control procedures familiar to many industries and to wholesale and retail outlets.

The microfilming camera—with its newly-expanded capacities for multiple filmings in a single operation—has gone far beyond earlier concepts of its functions and scope. It no longer is limited to saving filing and storage space and protecting valuable documents and records by utilization of the 8mm or 16mm film as an off-the-scene storage container of legally acceptable facsimiles. It is now an increasingly important tool in a wide range of office operations and record-keeping methods.

New indexing and filing systems, such as one which employs the visible control advantages of index cards, are substantially expanding its range as a personnel office machine and for other procedures in which related records are maintained in convenient and extremely compact form.

Problems Mount. With oil com-

panies constantly working to develop by-products and expanding their ranges of activity in the distribution and retailing fields, with many of them handling more extensive lines of accessories through their distributors and service stations, and with personnel increasing, problems of record processing and of filing and storage continue to mount.

Charge accounts at the retail level and greater credit handling at the wholesale distribution point create masses of additional records. Many companies are turning to cycle billing methods to handle this vast paperwork load with a minimum of disruption of established accounting, bookkeeping and credit department routines. Microfilming cuts detail work in cycle billing by doing away with the need for copying charge slips or preparing detailed descriptive invoices and statements.

In the case of the Canadian oil operations cited above, 9 of the 11 microfilming cameras are used in this active record preparation work of cycle billing. Only 2 of the 11 cameras are used at the company's home offices, for filing on film as a means of retaining various documents in convenient space-saving form.

The other nine microfilming machines are part of the standard billing-credit and collection systems set up in nine key distribution centers. Here, they lead to faster handling of the masses of detailed credits and charges and, in billing operations alone, they effect savings running from 10 percent per thousand items (or charges) to upward of 15 percent per thousand.

Because of its space saving capacities (in ratios up to 200-to-1), the microfilming method has become increasingly familiar to those charged with the retention and protection of records and documents which must be kept for long periods or which, because of their value, are recorded in facsimile copies for extra protection.

By its very nature, the oil industry has special and extensive record-keeping problems. From initial steps of locating possible oil bearing properties to drilling and transporting the crude, there are records which must be retained indefinitely, such as leases, seismograph charts, royalty arrangements and payments, etc.

Records Grow. In processing and research and development programs there are tremendous expansions of facilities, with all of the attendant expansions of records. Finally, as there is more and more activity in distribution and in retailing—of oil products, by-products and related accessories—there are still more records to be created, maintained and, in many instances, retained for varying periods.

Recent improvements in microfilming cameras have extended their range as an integral piece of office equipment in a number of ways.

For quite some time they were considered to be most practical for small and medium-sized documents and records, such as the 8½ x 11-inch and smaller correspondence, and for agreements and other papers of the size generally used for legal briefs and insurance policies. Today's microfilm camera can copy virtually any record, regardless of size or condition, reducing to a tiny fraction of their original size such cumbersome items as charts, plans, property descriptions and the like.

A significant recent development is the dual lens camera, which records exactly the images on both sides of a record in one operation, thus cutting such copying work in half.

Chief among the new developments in microfilm record housing is a card-and-index system which, by the insertion of strips of film in narrow die-cut slots of a card, provides folder-type filing for records in frequent or constant use. As many as 60 letter-size documents can be filed on a single 5-inch x 8-inch card.

This arrangement is particularly effective where it is desirable to segregate from a few to several hundred records on a single subject or related group. In this system, which is finding increasing favor for multiple-record personnel files, indexing is done either on a visible margin of the card (arranged on panels or slides and overlapping) or on the film, or both.

Where indexing is on the film strips, such as by name, number, title, date, or subject, it is done by filming identifying "targets." These can be read without the aid of an enlarging reader. Once the desired group of records is selected by means of this or the visible card indexing, a full-size or larger copy is thrown on the reader screen simply by inserting the card under the lens to the proper image position. Cards can be tabbed, color coded, etc., for fast reference.

Cards are cut so as to permit the slipping of individually filmed images or strips into one or more slots. Cards range in size from 2½ x 3 inches to 11 x 14 inches. New records can be added and inactive ones pulled at any time.

Space Saved. Although the space-saving potentials in this form of filing on film do not equal the ratios where the records are on 100-foot reels of film, the differential is still tremendous. For example, the paper content of an ordinary file drawer is 3000 to 4000 letters. The same drawer will hold more than 250,000 letter-size records on films inserted in the cards.

Because of operating simplicity and absence of need for special equipment, hookups or training, there is little or no problem involved in setting up a microfilming program. Where there are special problems of preparing old records or documents for a retention program and where their nature or number would disrupt work on current office routines, major suppliers provide trained crews to handle such special loads.

Once the system is in operation, often with only a little on-the-job training, the only requirements to convert any office staff members into microfilm operators is a reasonable degree of dexterity and interest in the work.

Where there are extensive distribution or retailing paperwork problems of handling credits and invoicing, microfilming of charge slips eliminates need for copying, proofreading or the preparation of descriptive invoices. In most instances, charge slips are fed through the camera and then attached to the invoice or statement sent the customer. The film is retained as the company record. And where procedures call for charge records at the distribution point and at the home office, a single processing with a dual-lens camera serves to provide both records.

A color stat or voltage control automatically regulates the extent of exposure required, so that the operator's job is limited to switching the machine on and off and feeding the documents.

Where a full-size or enlarged copy of a microfilmed record is needed, it can be reproduced quickly and economically with the reader or viewer unit.

—The End.

To discharge an employe by improper means is to invite repercussions in employe, community and customer relations.

You're Fired!

You don't dismiss an employe with such harsh words, of course, but even the kindest language hurts badly unless you have a planned approach.

By **AUREN URIS,** The Research Institute of America, Inc., New York

"YOU'RE FIRED."

Harsh words? Definitely. Firing an employe involves a real emotional wrench at both ends.

Sometimes executives lie awake nights, trying to figure a way out: "Transfer him to another department? Shift him to a less demanding assignment?" Or, another much considered alternative: "I'll do it next week, next month, next year."

Semantics Makes It Tougher

Even the language adds to the problem. Just consider some of the words that are used to describe the action:

fire	discharge
dismiss	terminate
release	

Not a pleasant word in the lot—which is proper enough since the action is usually not pleasant. But it's just one more factor that builds the atmosphere of emotional shock.

The Constructive Approach

Nevertheless, the facts may require that you act. After you have weighed all the pros and cons, made every consideration you can think of, you may still decide on dismissal. Then, you must move so as to accomplish certain specific objectives.

You may have one of a possible variety of objectives in letting an employe go. It may be the enforcement of discipline, removal of a source of friction, elimination of substandard performance. Or the company's situation may require a reduction in personnel. Whatever the reason, you must handle the discharge in such a way as to—

- Minimize the impact on the employe you're dismissing;
- Eliminate as much as possible any repercussions which will affect customer or community relations;
- Retain or improve group morale.

They're not easy targets. Your human relations skills and general executive ability may have to be exercised to their fullest extent. But the potential returns make it worth while.

It's unlikely that you're ever going to *enjoy* the process of firing. But a planned approach can eliminate many of the headaches and heartaches.

Here is a step-by-step procedure which can guide your actions:

1. Fair Warning

Hints are not enough. You must make it clear to the employe what the prospects are: "If the situation doesn't improve, we may have to replace you."

Certainly, it's a shocker. Yet, the warning must be specific and beyond any possibility of misunderstanding.

This approach, tough though it seems, accomplishes two purposes—

- You make it possible for the employe to alter or improve the failings which are causing you concern.
- You eliminate once and for all getting yourself into a situation where he may justly say: "It was up to you to let me know how bad the situation was."

2. Prepare Yourself

If you have gone through the ordeal of firing someone, you probably realize this fact: you, yourself, are at least 50 percent of the problem.

Accordingly, you must adjust your

mental machinery to be able to handle the firing interview properly.

It's largely a matter of throwing off compensatory attitudes, attitudes you assume to offset your own emotional involvement. If you have thought the decision through, are sure of the fairness of your stand, guilt feelings are unfounded.

But don't underestimate the depth of your feelings in such a situation. In few cases can you work closely with an individual without developing a sense of closeness and friendship. A situation you might be able to handle objectively may become almost unbearable when an old acquaintance is involved.

Part of your preparation, therefore, is to spot in your approach signs of tentativeness or defensiveness. Just as frequent is the tendency to cover up by a display of gruffness or argumentativeness.

Of course, there is another possibility. Where the person you're firing is one with whom you don't get along, you may feel the urge to make the interview the final (and for you, victorious) action in your feud.

But such an approach, needless to say, is a direct threat to both personal and company employe relations. Reaction to an executive who makes dismissal an opportunity to indulge in his personal spite is bound to be bad.

Accordingly, search for and eliminate in advance any tendency you may have to be bitter, sarcastic or vengeful. *The strongest note of the interview should be one of finality.* And you make that point best by being calm and matter-of-fact.

3. Lock the Door

This is one interview you want to be private. As a matter of fact, the way you conduct the interview in itself will determine the results you get. A slipshod, curt chat squeezed in between phone calls or in the hearing of any passerby, naturally makes the employe feel resentful.

The business at hand is important to the employe. He feels he is entitled to your full attention for as long as *he* thinks it's necessary.

Select, then, a time and place when you can talk without interruption. Use these points to guide your selection:

• Hold the talk as soon after you make the decision as possible. This will cut down the general feeling of drift that may affect both the employe and the rest of your group. Your own actions are likely to supply the tipoff. Once you have decided to let an employe go, you almost unconsciously stop treating him as you did before. Your change of manner will register and cause unrest among your other subordinates. They may even conclude that *you're* slipping.

• If possible, hold the talk during a lull in activity. Lunch time is one possibility; the end of the day another. This arrangement eliminates the usual work interruptions—the phone calls or unscheduled emergencies you can't prevent.

4. Start with Your Decision

It's best to make it clear at the outset what your intentions are. You don't want to be abrupt. Greet the employe and get him comfortably seated. Then, "Bill, we have discussed your work before. It has not improved and I am convinced now that you're only wasting your time if you stay on."

5. Stick to the Facts

You'll avoid the emotional quicksand by keeping the conversation centered on the facts of the case.

For example, you may want to review briefly the faults and the steps you have taken to help him eliminate them. Don't be content to make general statements. Cite concrete, specific examples.

Note: If he can argue that you never called these matters to his attention before nor indicated their importance, you're in a weak position.

To eliminate pinning yourself into a corner, be sure in advance that you have lined up your examples carefully. This eliminates the need for you to grope for the facts.

The extent to which you'll review the record depends on the individual case. Where the individual is really at a loss for your action, you may want to spell out the warnings and the possible consequences you voiced.

In specific cases, executives who see the handwriting on the wall, may make a practice of keeping a written record of such pre-warning conversations.

6. Ease the Tension

It's a rare employe who is not under strain. It's up to you to help him release his tension. Your best move is to let him have his say. It's usually the rare case where the employe will admit that your decision is just. Here are some of the more likely possibilities:

• The tearful appeal. To this response, your strongest argument is that any other decision would only postpone the inevitable action.

• The angry denunciation. If this is the reaction you get, you may have to restate your case. But don't argue about it. If he can't be made to see the situation as you do, close this phase of the interview by indirectly indicating your decision is irrevocable: "You may not agree with me now, John, and I can understand your feelings. But some months from now, when you've settled in another job, you'll probably see it my way."

• Request for a "higher court." He may want to go to your boss to tell his side of the story. If that's the case, it's usually wise for you to agree. If you try to talk him out of it, it's only likely to heighten the desirability of the move in his eyes. The more readily you agree, the less likely he is to go through with it.

Of course, it goes without saying that your original decision must be sound enough to stand up under the examination of your superiors.

7. Help Him Along

Keep in mind the most painful aspect of his position. Essentially, you have just told him that he has failed. And it's failure at a vital point. Of course, you can point out that it's a failure largely dictated by *circumstances* rather than his personal limitations. Nobody is suited for every type of job. Nobody can fit into every type of situation which develops around a given job. You can diminish his feelings that the ground has been cut out from under him. Do it by pointing out other directions in which he can turn:

"While the place here isn't suited to your temperament, you'll find other jobs of this kind much easier by comparison."

"You can make this a real opportunity to find the type of work in which you're really interested, more in line with your ability."

You don't want to give him a rosy description of his chances, which he will instinctively know is over-colored. But in many cases, you can give specific assistance:

. . . Recommend the most likely direction in which he can go. "If you'd like to have my opinion, your best bet

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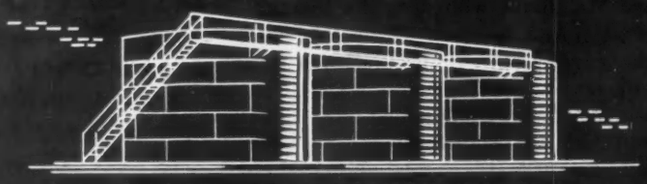

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is a job where you can use your selling ability."

. . . A definite lead, if you know of any. "I hear that X Company is looking for men with your general background. Why don't you go up and see Mr. Jones who does the hiring?"

. . . And in cases where you think the suggestion will be well received, you may want to suggest weak points which, when strengthened, will better suit him for employment: "Brushing up on your mathematical ability would qualify you for a higher-paying job."

And if you can say it sincerely, add finally: "If I can be of help at any time, please let me know."

8. The Face-Saving Angle

For many an individual, the toughest aspect of the situation lies in concern over the reaction of fellow employes. He may be less distressed over losing his job than with the reaction of his colleagues.

Sometimes, by just taking into account an individual's sensitivity regarding his standing in the group, you can ease the shock. Give him a chance to save his face, make him seem less of a failure.

That's why, in many cases, it's advisable to let a discharge pass as a voluntary resignation. Except where discipline is involved, this is frequently a method worth your consideration.

In any event, there is no reason for you to catalog an employe's deficiencies in public. In anything you may say to other employes, you need not condemn or criticize the ability or personality of the man who's leaving. The simple statement: "He didn't fit in" is usually adequate.

9. Smooth the Departure

It will make a big difference to the employe's peace of mind, as well as the reaction of colleagues, if the departure is handled according to a logical plan.

It's unwise to have the employe flounder across the finish line. Left to his own devices, he is apt to become a destructive force. On the other hand, there are usually many matters that require attention: your company's severance procedure may need explaining; you may have to arrange an appointment for the individual to see some one in the Personnel department. Departmental or company-wide sever-

Continued on Page 59

The Courts Say . . .

in recent insurance cases

Shelton

This column is to inform—not advise. It presents the current trend in legal thinking on insurance cases. The law varies from state to state and its application depends upon the facts of the particular case. Do not attempt to apply it without consulting your attorney.

JOSEPH M. SHELTON, Attorney at Law, Dallas

That Traumatic Neurosis is compensable

EMPLOYE sustained injury to his foot and elbow due to an industrial accident and was totally disabled for four weeks. A pyschiatrist testified that there would be continued disability for six months due to neurosis. Trial court awarded judgment for employe. Insurance carrier appealed and the Court of Civil Appeals reversed the trial court on appeal by the employe.

The Texas Supreme Court said the Workmen's Compensation law provides that an injury is "damage or harm to the physical structure of the body and such diseases or infection as naturally result therefrom" (Art. 8309, Sec. 1, T.R.C.S.). Neurosis of the character suffered by the employe is a disease. He can not use his physical powers. He is incapacitated to do labor. The incapacity is not simulated; it is very real. The evidence warranted the trial court's finding that the neurosis resulted from the physical injury.

—Hood v. Texas Indemnity Ins. Co.
209 SW 2d 345 (Tex. Sup. Ct., 1948)

That employer is presumed to know "injury" includes aggravation.

EMPLOYE CLAIMED that by reason of a fall, left leg was injured to the extent of total disability. Evidence disclosed pre-existing disability to the knee. Employe offered evidence that the accident aggravated the pre-existing condition. Employer said that can't be considered because "we had no notice of such a claim." Your claim was that accidental injury caused the disability—not aggravation." The trial judge excluded evidence of aggravation and the employe appealed.

The appellate court said if a blow to the leg injures that leg by aggravating a pre-existing disease, it is no less an injury from the blow within the meaning of the compensation act. Since the employer is presumed to know that rule of law, it is logical that a claim for injury to the leg by accident is sufficient to notify the employer that an aggravation may be claimed.

—Ledford v. Miller Bros. Co.
253 SW 2d 552 (Tenn. Sup. Ct., 1952)

That an injury may itself be an accident

EMPLOYE WAS A TRUCK DRIVER and while unloading a truck load of equipment on a freight platform suffered a heart attack and died before reaching a hospital. Widow claimed compensation. Employer defended on the ground that there was no "injury by accident" as required in the compensation act.

The Tennessee court said "injury by accident" is not confined to injury caused by "violent, external, accidental" means. An internal injury that is itself sudden, unusual, and unexpected is none the less accidental because its external cause is a part of the victim's ordinary work. The award of compensation to the widow is affirmed.

—Patterson Transfer Co. et al. v. Lewis
260 SW 2d 182 (Tenn. Sup. Ct., 1953)

You're Fired!

Continued from Page 54

ance procedures should be followed carefully.

In addition, there are two more points requiring your consideration:

In what shape is his work? In general, it's desirable to have a discharged subordinate leave as soon as possible. Depending on his attitude, however, you may want him to wind up his job. If it's practical from a personality viewpoint, you may even want him to take his successor in tow and acquaint him with the details, the loose ends and so on.

Finally, can you give him a chance to bow out gracefully? He would probably like to say goodbye without seeming to sneak off under a cloud.

Your attitude provides the principal key to the others. You can clearly show there is no reason for shame in his leave-taking, no hard feelings, no reason for doubts or resentments.

If the way is clear for a public announcement of the fact, it may be best to tell the group: "I am sorry to say we are going to lose Henry. You girls better line up if you want to kiss him goodbye."

10. Analyze the Case

There's a lot to be learned from dismissals. In most instances where a subordinate is fired, there is a lot you can learn, personally. Questions like these help your analysis:

Why was the dismissal necessary?

What went wrong?

When should the trouble first have been detected?

Where exactly was the weakness?

Was it—

. . . hiring policy?

. . . your own inability to size up the man at the applicant stage?

. . . did he receive sufficient training?

. . . were orientation efforts made on his behalf intelligent and sufficiently strong?

And finally, the clincher—

How could it have been prevented?

The more intensive a study you make of your dismissals, the less of them you are likely to have. This brings automatic benefits—greater efficiency, better integration of your group as a whole, for the future.

—The End

The Big Moment . . .

for J. L. LATIMER

MAGNOLIA PETROLEUM Company might not have J. L. Latimer as its president today if he had not lost his trunk. And Latimer probably would not have that well known nickname "Slatz" either.

It happened back in 1915 when John Leslie Latimer, then a gangling 18-year-old, traveled to Texas from Olean, N. Y., looking for a job. He was so sure that his uncle, Ed Latimer, then general superintendent of Magnolia's pipe lines, would put him on the payroll that he had his trunk sent to Uncle Ed's home in Dallas.

The Magnolia pipeliner gave his nephew a job. Young Latimer was to be a loading rack helper at Thrall, Texas.

The night before he left Dallas on his way to his new job there was the trivial matter of getting his trunk to the depot, but that couldn't interfere with his plans to go out on the town with a new-found buddy. The transfer truck was late so the trunk was left on Uncle Ed's front porch and trusted to luck. Next day there was no trunk at the station and there was young Latimer with no claim check and a meager amount of money. But he went to Thrall, anyway.

"I didn't tell Uncle Ed because I was afraid he would fire me before I started to work."

At Thrall the thin kid had tough sledding. He had to endure the usual hazing of the seasoned pipeliners. As a new hand, of course, he drew the night shift. He had used up what little cash he had to buy work clothes. But worse of all, he was seized with that terrible teen-age disease—homesickness.

"I sure wanted to go home to Olean," "Slatz" Latimer now recalls with a smile.

The Big Moment for the future Magnolia president came when he decided that his pride and determination would not let him quit, and it went by unnoticed even by "Slatz." It was the simple realization of an 18-year-old boy that he just couldn't—and wouldn't—go home broke and without any clothes.

It was some time before the trunk was traced. The transfer company had delivered it to the depot but the station master was off home grabbing a bite to eat. Meanwhile, a thief had lifted it from the platform.

It took five months for Bill Maddox, Magnolia's assistant traffic manager at that time, to work out a settlement which netted "Slatz" $150 for his stolen wardrobe. By then the young Yankee was thoroughly Texanized, accepted by his fellow pipeliners who had given him the nickname "Slatz," which stuck, and he had forgotten all about wanting to go home. It was too late to change "Slatz" Latimer; he was wrapped up in learning about the business of a company he was to head 30 years later.

When he thinks about it, Latimer still wonders what might have happened to him if his trunk had arrived on schedule at Thrall, Texas, one December day in 1915. Perhaps he should be thankful for the carelessness of a baggage master whose name has been long forgotten.

More Uniform Prices on Natural Gas Are Desirable

Pricing of natural gas at the wells has involved inequalities toward different producers, and although this is a complicated problem, efforts to achieve more uniformity of prices are needed.

As a move in this direction, the Texas Independent Producers and Royalty Owners Association plans to publish the "posted" price for gas from a given field each month in the future. "It seems ridiculous that gas of the same quality and value from the same field and properties should command a wide variation in prices," stated E. I. Thompson, executive vice president of the association. The first report, published in November, showed that in the Carthage field, Panola County, Texas, six pipe line companies were paying different prices ranging from 7 to 11½ cents per thousand cubic feet.

In the oil business, purchasers post crude prices, and usually all purchasers ultimately have to post the same price in competing with other buyers. The producer may on short notice quit selling to one purchaser and begin selling to another, or he may store the oil in tanks if he does not wish to sell at the price posted.

In contrast, the Federal Power Commission requires gas utilities to hold long term gas purchase contracts before granting permission for building pipe lines, and producers must make such contracts in order to sell their gas. The gas producer does not have the privilege of switching his sales to other buyers or of storing his gas in tanks to sell later. Old contracts were made on the basis of low prices because gas formerly was of small value. Now gas is much more valuable, and competition for supplies has forced prices up materially. The result is a wide range of prices for similar gases in adjacent areas.

There has been some voluntary renegotiation of prices upward on old contracts, and more such adjustments probably would be made if it were not for FPC controls, which have been aimed particularly at keeping the consumer prices low.

Heretofore FPC has not attempted to fix wellhead prices of gas, but the U. S. Supreme Court ruled November 30 that the commission has such power and responsibility. It remains to be seen what effect the decision will have on gas prices at the well and whether the commission will attempt to bring about more uniformity of prices as a part of its efforts in connection with prices.

Synthetic Setup Loses Its Lure

Continued shutdown of the $50 million Carthage Hydrocol plant at Brownsville, Texas, increases doubts of the present economic feasibility of synthetic plants for making liquid fuels primarily from natural gas rather than crude oil.

The large investment in the Texas plant appears to be largely lost. The plant was designed to make 7000 barrels daily of aviation gasoline, diesel fuel, and chemicals from cheap natural gas. Construction started in 1945, when crude was scarce and synthetics were getting much attention. The plant opened in 1950, but it rarely exceeded 10 percent of capacity, and it was shut down last summer.

Eight companies, including The Texas Company, United Gas Corporation, Stone & Webster, and others put up $10 million initially and more later, and the RFC supplied $18 million. Recently, United Gas revealed in a prospectus for $25 million of new debentures that it wants to write off its investment of nearly $4 million in the Carthage Hydrocol plant as a "complete loss."

Also apparent heavy losers are Standard Oil Company (Indiana) and U. S. Industrial Chemicals (now merged with National Distillers), which spent about $11 million for plants built next door and intended to use products of Carthage Hydrocol.

The Brownsville plant represented an American modification of the Fischer-Tropsch process through which the Germans made liquid fuels from gases derived from coal.

While there is doubt of the present economic feasibility of basing a refinery's operations on dry natural gas, some observers say the Carthage Hydrocol plant does not necessarily condemn the idea or the process it employs. They allege that the plant was not properly designed or engineered. They state further that any plant achieving throughput of only 10 percent of designed capacity obviously could not be profitable.

The prospects of more synthetic plants for deriving oils from natural gas are now dimmed not so much by technological limitations as by economic considerations. There is now a world plenty of crude oil. On the other hand, available supplies of natural gas in the U. S. have been steadily tightening up, and prices of natural gas consequently have been substantially increasing.

It is less promising than a decade ago to consider using natural gas for making liquid fuels, which can be obtained so readily and economically from crude oil.

In One Pocket . . .

For a majority of employes there will be very little difference in take-home pay beginning in January, 1954, as the net result of a reduction and an increase in two important federal taxes.

An increase in Social Security tax effective January 1 will in most cases offset a good portion of the scheduled reduction of about 10 percent in personal income taxes on the same date.

The Social Security tax is being increased from 1½ percent to 2 percent on the first $3600 earned during the year. This tax must be paid by the employer as well as the employe.

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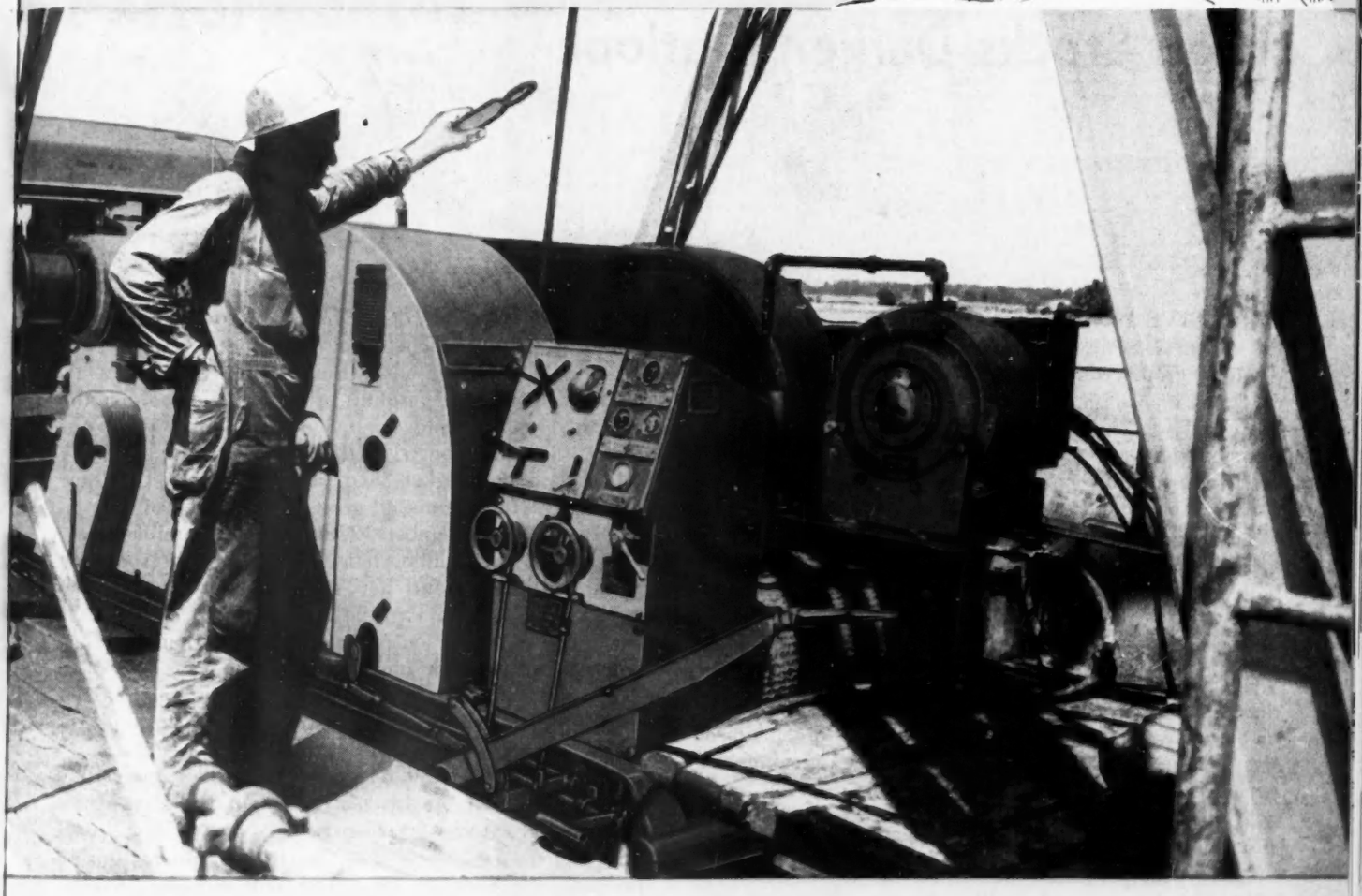

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By **RAY L. DUDLEY,** Publisher, and **WARREN L. BAKER,** Editor

High Stocks Darken Outlook

EXCESSIVE PRODUCT STOCKS continue to darken the industry's economic outlook. While lower crude stocks resulting from reduced producing rates have improved crude oil's position, this is offset by the depressing influence of weakening product markets. Mild weather has softened demand, causing burdensome refined product inventories despite some recent reduction in refinery runs from earlier volumes.

Consequently, the industry is still confronted with the necessity of cleaning up its product market. Otherwise, both crude and product prices are in danger.

•

THE NEXT MONTH WILL TELL MUCH. The industry's position likely will be either considerably worse or better by the end of January. A great deal depends on the weather. If any real winter weather is to be experienced, it should show up in January. A long severe cold wave is needed to ease the excessive product stock situation.

So far, temperatures this winter have been relatively mild. This has reduced distillate heating oil consumption below expectations. Consequently, distillate fuel stocks are excessive in the midst of their heavy consuming period.

A prolonged cold spell would greatly change the picture, providing refinery runs stay around 6.9 million barrels a day or less. Heavy reductions in distillate stocks would strengthen this market, which would prompt refiners to manufacture more heating oil and less gasoline. Therefore, the motor fuel market also would benefit. This would relieve the pressure that depressed product markets are having on crude oil.

On the other hand, continued mild weather will cause the situation to become more acute. Even if refinery runs remain curtailed, the absence of cold weather will put too much gasoline into storage and prevent sufficient draft on distillate stocks. This would bring further reductions in product prices, which would put crude prices under severe pressure.

THE SERIOUSNESS of the refined product situation is demonstrated by recent wholesale price cuts for both distillate fuel and gasoline. Burdensome inventories already have brought gasoline price reductions along the Atlantic Seaboard and some Southern states, while distillate prices have sagged in the North Atlantic area.

The gasoline market faces a critical period. Motor fuel stocks will continue to grow until the end of March. Inventories on December 12 totaled 152½ million barrels, up nearly 23 million barrels from the corresponding period of 1952. A month ago, they were only 21⅔ million barrels greater than the 1952 levels. Refiners definitely need to reduce their output of gasoline. Otherwise, they will be placing motor fuel prices in jeopardy.

The distillate fuel situation also is unfavorable, although in the midst of the heavy consuming season for this product. Stocks of distillate fuel oil on December 12 amounted to 126¾ million barrels, 17 million more than a year ago. Half of this increase is in the East Coast region, where stocks are 20 percent above 1952 volumes.

Unless the refined product situation improves during January, the pressure on prices will increase sharply. Further reductions in refined product prices will put very heavy pressure on crude markets.

•

HIGHLY ENCOURAGING is the improvement shown by the crude oil market. Reduced producing rates during the past 2½ months dropped crude oil stocks to 277½ million barrels by December 12, approximately 12 million barrels less than at the end of September. During this period, crude production averaged roughly 350,000 barrels less per day than in the preceding three months.

The crude situation is due to be strengthened further in January, with production scheduled to continue at curtailed levels.

Consequently, the industry's present economic troubles now spring entirely from depressed product conditions. Reduced refinery crude runs, coupled with cold weather boosting distillate demand, could greatly improve the situation. The next month will tell.

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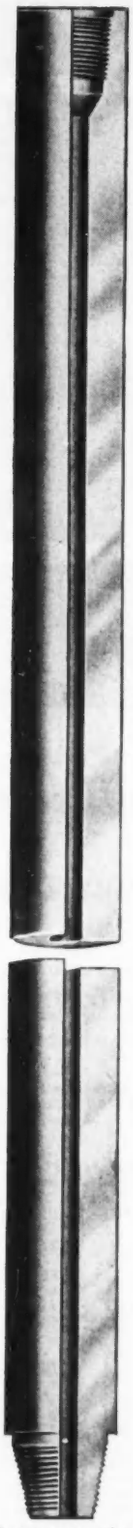

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First

. . . in selecting the steel to be used in a Drill Collar, chemical specifications alone are not enough!

For example, simply specifying that a Drill Collar be made of a certain AISI specification steel—or any emergency substitute—permits far too great a variance of alloys to obtain uniform physical properties in the finished product.

Alloys that produce uniform properties when used in small cross-sections produce entirely different sub-surface properties when used in a thick-walled Drill Collar. Therefore, the steel used in Drill Collars should be selected by the "hardening characteristics" as well as by chemical specification.

Baash-Ross does this by checking the "End Quench Hardenability" index of each individual heat of specified steel to determine exact hardening characteristics. Then, based on this test, each heat of steel is separately classified as to the size of product cross section that particular steel is to be made into to secure the desired uniform physical properties in the finished product.

Thus, Baash-Ross assures each Drill Collar having accurately-controlled sub-surface as well as surface physical properties. Repeated re-cuts can be made on the threaded ends without sacrificing thread strength or hardness!

Second

. . . specifying that the Drill Collar should be heat-treated to a certain hardness is not enough!

The really important thing is *how* the Drill Collar is processed—how it is heat-treated to develop its best physical properties.

Through years of experience, Baash-Ross has learned that these processing steps are quite critical and must be accurately controlled to produce a Drill Collar free of structural defects and residual stresses. First, the bar is normalized and tempered over its entire length in one operation to produce a stress-free homogeneous structure with the desired physical properties.

After the bar has been machined to the specified outside and inside dimensions, each end of the Drill Collar is again treated by an oil quench and tempering operations to produce the required uniform physical properties necessary for the threaded end zones.

Thus, a Drill Collar is produced that is free from residual stress to assure sustained straightness—with high impact values to resist shock loading—and with the end zones of such uniform physical qualities as to permit repeated recutting without reduction of original joint strength!

Third

. . . specifying the size and type of joint desired on the Drill Collar is not enough!

Almost any machine shop can cut joints that will reflect proper gage standoff and will thread together. But the important thing is whether the joint is machined to obtain its full designed efficiency. Joints that are not produced with accurate thread form, lead and taper will permit wobble and cause failure. Furthermore, joint alignment in Drill Collars is particularly important because the rigidity of these members concentrates mis-alignment stresses on the threaded connections and is the most common cause of joint failure in Drill Collars.

Baash-Ross asures accurate thread form, lead and taper in every joint by a prescribed method of checking and gaging that goes far beyond standard gaging standoff tests. Then the alignment of every joint is precisely checked with a Baash-Ross Alignoscope* to assure its not varying by more than 1/10 of 1% of theoretically perfect with respect to the longitudinal axis of the Drill Collar—virtually perfect alignment!

**Write Baash-Ross Tool Co., Los Angeles, for descriptive data on the Alignoscope and its unique features.*

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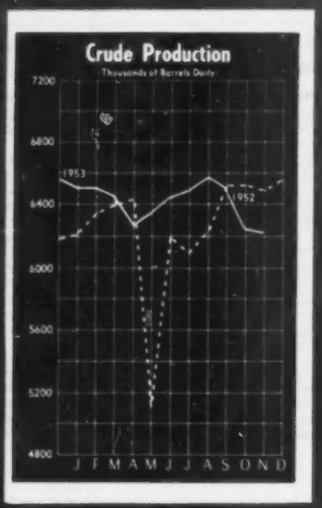
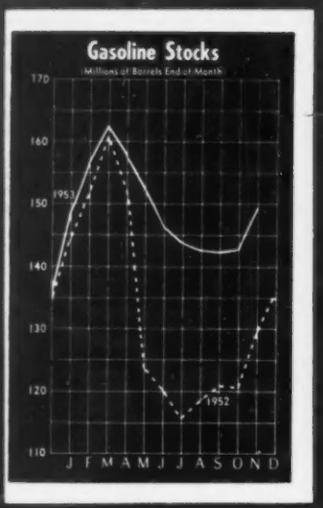
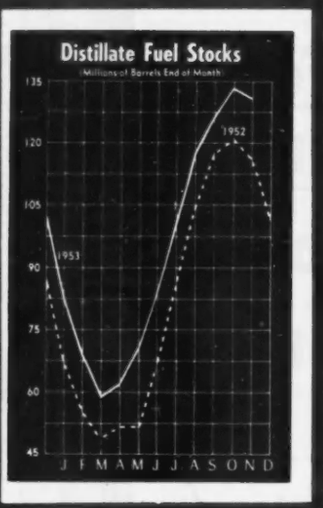
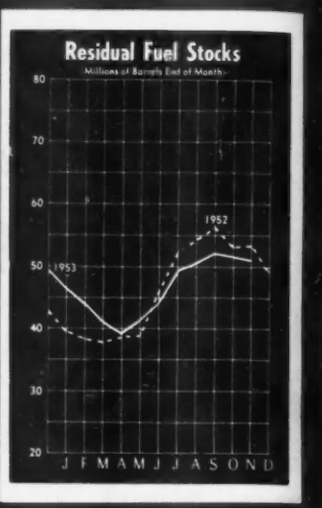
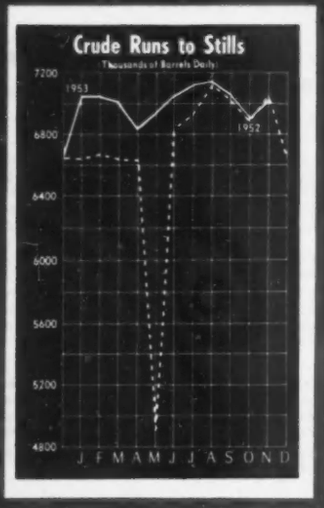
For additional data on the many rigid specifications used in manufacturing Baash-Ross Drill Collars, see the Drill Collar pages in the Baash-Ross section of your latest Composite Catalog. Or write direct!

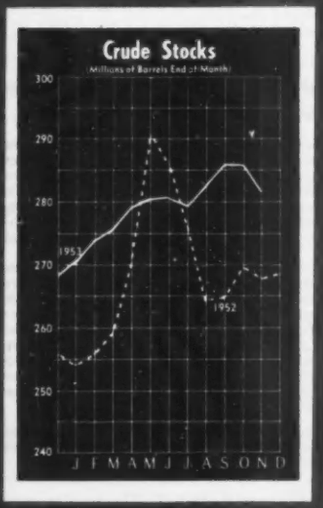












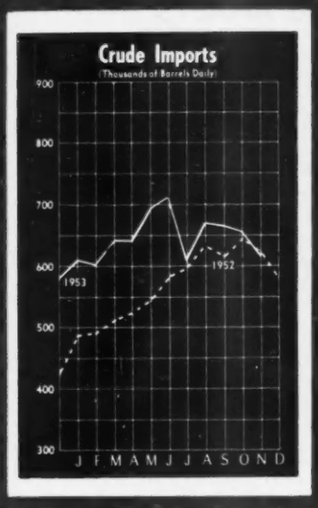
Petroleum Trends in the U. S. . . .

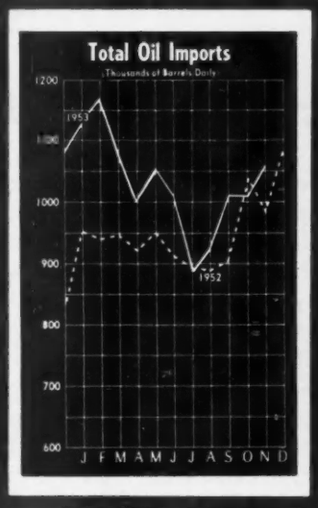
Crude output at lowest in 15 months . . .

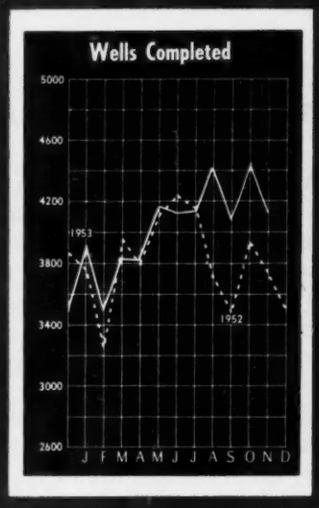
U. S. Crude Production by States

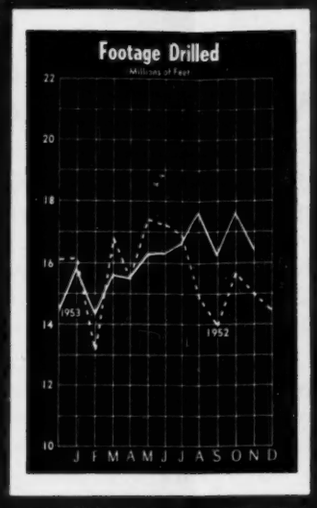
(Thousands of Barrels)

STATE or DISTRICT	DAILY AVERAGE PRODUCTION				TOTAL PRODUCTION First Eleven Months		
	November, 1953	October, 1953	November, 1952	% Diff. November, '52-'53	1953	1952	% Diff. '52-'53
Alabama	4.7	4.8	3.9	+ 20.5	1,584	888	+ 78.4
Arkansas	78.1	76.5	81.7	— 4.4	27,065	27,002	+ 0.2
California	996.8	994.0	985.6	+ 1.1	333,480	328,677	+ 1.5
Colorado	107.1	105.7	83.2	+ 28.7	30,363	26,528	+ 14.5
Florida	1.5	1.5	1.5	.....	500	546	— 8.4
Illinois	169.0	167.6	162.5	+ 4.0	53,858	53,575	+ 0.5
Indiana	34.2	34.2	32.9	+ 4.0	11,995	10,989	+ 9.2
Kansas	270.1	233.6	316.6	— 14.7	105,561	104,283	+ 1.2
Kentucky	32.6	32.4	30.0	+ 8.7	10,558	11,078	— 4.7
Louisiana	683.8	638.9	690.0	— 0.9	233,188	220,198	+ 5.9
North Louisiana	106.7	104.8	114.3	— 6.7	37,796	38,860	— 2.7
South Louisiana	577.1	534.1	575.7	+ 0.2	195,392	181,338	+ 7.8
Michigan	34.5	32.5	33.7	+ 2.4	11,241	12,124	— 7.3
Mississippi	93.3	91.8	98.8	— 5.6	32,390	33,140	— 2.3
Missouri	.....	0.1	.....	.....	20	20	.....
Montana	34.2	33.5	28.9	+ 18.3	10,614	8,614	+ 23.2
Nebraska	12.9	13.1	7.9	+ 63.3	5,292	2,115	+150.2
New Mexico	202.9	202.0	173.1	+ 17.2	64,517	53,613	+ 20.3
New York	11.6	12.2	10.5	+ 10.5	3,621	3,904	— 7.3
North Dakota	13.4	13.4	10.4	+ 28.8	4,722	1,208	+290.9
Ohio	10.4	10.7	8.4	+ 23.8	3,239	2,925	+ 10.7
Oklahoma	521.1	519.0	531.6	— 2.0	185,966	175,483	+ 6.0
Pennsylvania	25.9	26.8	28.1	— 7.8	9,668	10,225	— 5.5
Tennessee	.....	0.1	.....	.....	11	9	+ 22.2
Texas	2,622.9	2,740.9	2,959.7	— 11.4	942,888	933,276	+ 1.0
Dist. 1—South Central	38.7	39.1	39.2	— 1.3	12,570	11,392	+ 10.3
Dist. 2—Middle Gulf	142.7	151.2	179.2	— 20.4	52,420	53,714	— 2.4
Dist. 3—Upper Gulf	442.1	459.5	519.3	— 14.9	157,692	159,283	— 1.0
Dist. 4—Lower Gulf-S.W.	246.9	260.0	280.6	— 12.0	87,368	86,766	+ 0.7
Dist. 5—East Central	45.6	47.9	54.3	— 16.0	16,383	18,199	— 10.0
Dist. 6—Northeast	358.3	372.4	394.4	— 9.2	126,364	130,505	— 3.2
Dist. 7-B—North Central	118.2	117.9	118.4	— 0.2	37,849	31,633	+ 19.7
Dist. 7-C—West Central	159.7	167.4	184.0	— 13.2	55,456	49,669	+ 11.7
Dist. 8—West	809.6	864.3	1,046.8	— 22.7	301,555	316,306	— 4.7
Dist. 9—North	184.5	185.8	191.7	— 3.8	60,965	56,057	+ 8.8
Dist. 10—Panhandle	76.6	75.4	80.8	— 5.2	25,167	27,427	— 8.3
Utah	4.6	4.8	5.2	— 11.5	1,667	1,576	+ 5.8
Virginia	0.1	0.1	.....	.....	14	9	+ 55.6
West Virginia	9.3	9.5	6.6	+ 40.9	2,742	2,357	+ 16.3
Wyoming	232.2	240.4	196.2	+ 18.3	77,084	61,990	+ 24.3
Total United States	6,207.2	6,240.1	6,487.0	— 4.3	2,163,848	2,086.352	+ 3.7





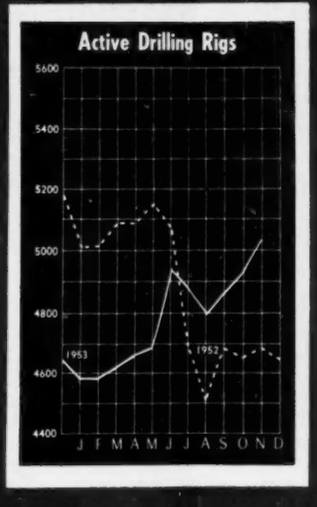




By CECIL W. SMITH, WORLD OIL Staff

Oil imports reach six-months peak . . .

. . . Active drilling rigs at 1953 high

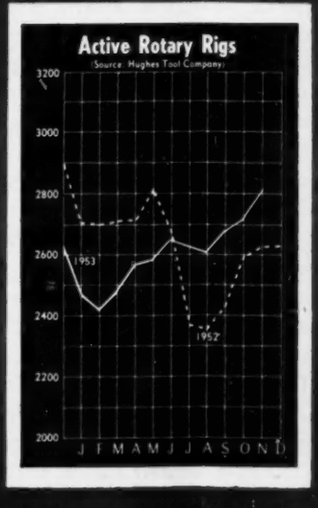


Crude Oil and Refined Products Trends

(Thousands of Barrels)

MONTH	CRUDE OIL			GASOLINE		DISTILLATE FUEL		RESIDUAL FUEL		DAILY IMPORTS	
	Production Daily	Runs to Stills Daily	Stocks End of Month	Production Daily	Stocks End of Month	Production Daily	Stocks End of Month	Production Daily	Stocks End of Month	Crude Oil	Total Oils
1951:											
October	6,375	6,446	262,266	3,105	118,864	1,295	109,544	1,224	49,573	421	769
November	6,272	6,609	261,100	3,130	122,723	1,358	101,666	1,304	46,491	425	802
December	6,182	6,646	255,783	3,150	134,867	1,442	86,619	1,313	42,853	423	834
1952:											
January	6,217	6,640	254,007	3,094	144,339	1,456	66,969	1,338	39,523	488	951
February	6,367	6,673	255,900	3,109	151,912	1,528	55,369	1,322	38,295	491	940
March	6,388	6,640	259,126	3,069	160,689	1,400	48,750	1,274	37,971	510	947
April	6,429	6,435	270,679	2,995	151,890	1,312	51,634	1,253	38,561	539	922
May	5,107	4,905	290,813	2,295	123,656	982	51,648	979	38,821	545	951
June	6,197	6,825	285,964	3,169	120,166	1,455	65,911	1,228	45,688	581	911
July	6,093	6,927	275,951	3,295	116,566	1,475	85,775	1,237	52,245	597	892
August	6,219	7,118	264,368	3,377	118,592	1,514	104,257	1,252	54,061	632	879
September	6,518	7,017	264,723	3,428	120,991	1,502	117,252	1,230	56,200	615	932
October	6,518	6,883	269,776	3,301	120,062	1,458	120,721	1,203	53,052	643	1,037
November	6,487	7,049	267,852	3,416	129,509	1,510	116,096	1,299	53,069	624	984
December	6,634	6,952	271,928	3,361	136,028	1,509	99,582	1,302	48,706	603	1,165
1953:											
January	6,555	7,042	272,250	3,384	150,518	1,528	80,655	1,307	45,910	616	1,135
February	6,562	6,969	273,589	3,379	157,873	1,505	67,167	1,275	44,178	586	1,066
March	6,531	7,002	275,665	3,319	162,731	1,489	59,802	1,256	41,600	655	1,112
April	6,446	6,781	280,487	3,282	158,032	1,424	61,349	1,219	39,572	628	1,010
May	6,390	7,002	280,308	3,459	156,415	1,400	73,706	1,197	41,795	703	1,096
June	6,595	7,081	283,715	3,467	146,196	1,462	84,504	1,238	43,801	707	1,050
July	6,603	7,103	284,976	3,583	143,916	1,441	102,394	1,224	47,966	629	946
August	6,583	7,163	285,352	3,592	146,050	1,437	119,542	1,222	50,007	672	946
September	6,557	7,023	289,614	3,521	144,184	1,448	126,709	1,203	50,516	692	1,013
October	6,240	6,878	286,401	3,417	143,368	1,452	134,631	1,175	51,558	659	1,010
November	6,207	7,012	281,989	3,490	149,915	1,470	132,317	1,180	50,955	623	1,062
Nov. 1953 Change:											
In Month	−33	+134	−4,412	+73	+6,547	+18	−2,314	+5	−603	−36	+52
In Year	−280	−37	+14,137	+74	+20,406	−40	+32,735	−122	+2,249	+20	+103
Week Ended											
12-12-53	6,225	6,915	277,410	3,500	152,509	1,481	126,710	1,157	50,455	549	1,096
12-13-52	6,562	6,715	269,541	3,303	129,582	1,501	109,675	1,283	49,881	712	1,239

Source: Data for last two months from API; prior monthly data from Bureau of Mines.



Widening Markets to Stimulate Activity in Canada

Exploration and drilling in Western Canada probably will be greatly stimulated as a result of the progress now being made toward providing markets for the natural gas which is being developed.

Alberta has taken another major step which is expected to lead to the export of natural gas to eastern Canada and parts of the central northern states of the U. S. Meanwhile, an earlier application for the export of Alberta gas to the U. S. is still pending before the Federal Power Commission in Washington.

A report of the Alberta Petroleum and Natural Gas Conservation Board handed down recently announced that the board has found Alberta has enough gas reserves to allow additional export.

The board recommended that two companies, Trans-Canada Pipe Lines Ltd. and Western Pipe Lines, join forces to provide a pipe line from Alberta to Ontario and Quebec, with a branch line extending south from Winnipeg to Minneapolis. Both companies had applied to the board for permits, Trans Canada for an all-Canadian line, and Western for the U. S. route.

Huddle Planned. As it now stands, the federal government has announced it will call the two companies together in an effort to work out a plan that will be satisfactory to Alberta. Premier Manning of Alberta stated that if an economically feasible plan is presented by the companies, the Alberta government will issue an export permit.

Gas reserves established for the proposed line are located mainly in the central and southern parts of Alberta. In the north, other large gas reserves have been tapped by Westcoast Transmission Company, which wants to take gas to the Pacific Northwest.

In a third export area, at the southern edge of the province, Alberta has agreed to the export of up to 334 billion cubic feet of gas through the Canadian Montana Pipe Line company. This line has been in existence and limited amounts of gas have been going on a five-year permit basis to the Anaconda plant in Montana. The latest order approved the increase of gas to this market.

The board's latest report states that Alberta's gas reserves have now been placed at 11.5 trillion cubic feet, an increase of 4.7 trillion cubic feet in 1½ years. This increase is substantially more than the yearly increase estimate of 1 to 1½ trillion cubic feet a year made in March of 1952.

Key feature of the Alberta propsals is the insistence that an "economically feasible" arrangement be reached by all concerned in the export plans. While no prices were suggested, the province points out that a well-head price which will provide a satisfactory income and incentive for operators must be achieved, plus an end price to consumers that will meet competition in the areas where the gas is marketed.

It was felt that the joint project would provide the safest means of insuring economic marketing of the gas, while either of the suggested lines alone was running the chance of an economic breakdown.

Manning said that the U. S. market in Minnesota should be established, because Alberta in a few years was "desperately" going to need expanded markets.

Manning said that Alberta was not concerned with the situation in eastern Canada, where Consumers Gas Company of Texas has been granted a limited market in the Toronto area. The premier said that the Alberta project would take two years to complete, and it was hoped that by that time a market could be built up in the east.

The over-all estimated cost of the project is around $300 million not counting the gathering system and processing plants which would be necessary in Alberta. Most of Alberta's gas needs processing before export, and the province has stipulated that all valuable components be removed before the gas is exported.

The plan states that the provincial gathering system would stay under control of the province, its only duty being to deliver the gas to an export point on the east border of the province.

The oil and natural gas pipe line system for the transmission of Alberta products to the rest of Canada and the U. S. now lines up like this:

In Operation (Oil).—Interprovincial Pipeline east to Superior, Wisc., and east to Sarnia, 150,000 barrels a day. Trans Mountain line west to the Pacific coast, 50,000 barrels a day (120,000 barrel capacity).

In Operation (Gas).—Canadian Montana Pipe Line Company from southern Alberta to Montana.

Planned (Gas).—Westcoast Transmission from northern Alberta to the Pacific Coast. Joint Trans-Canada Pipe Lines Ltd.-Western Pipe Lines, east to Ontario and Quebec, with a branch from Winnipeg to Minnesota.

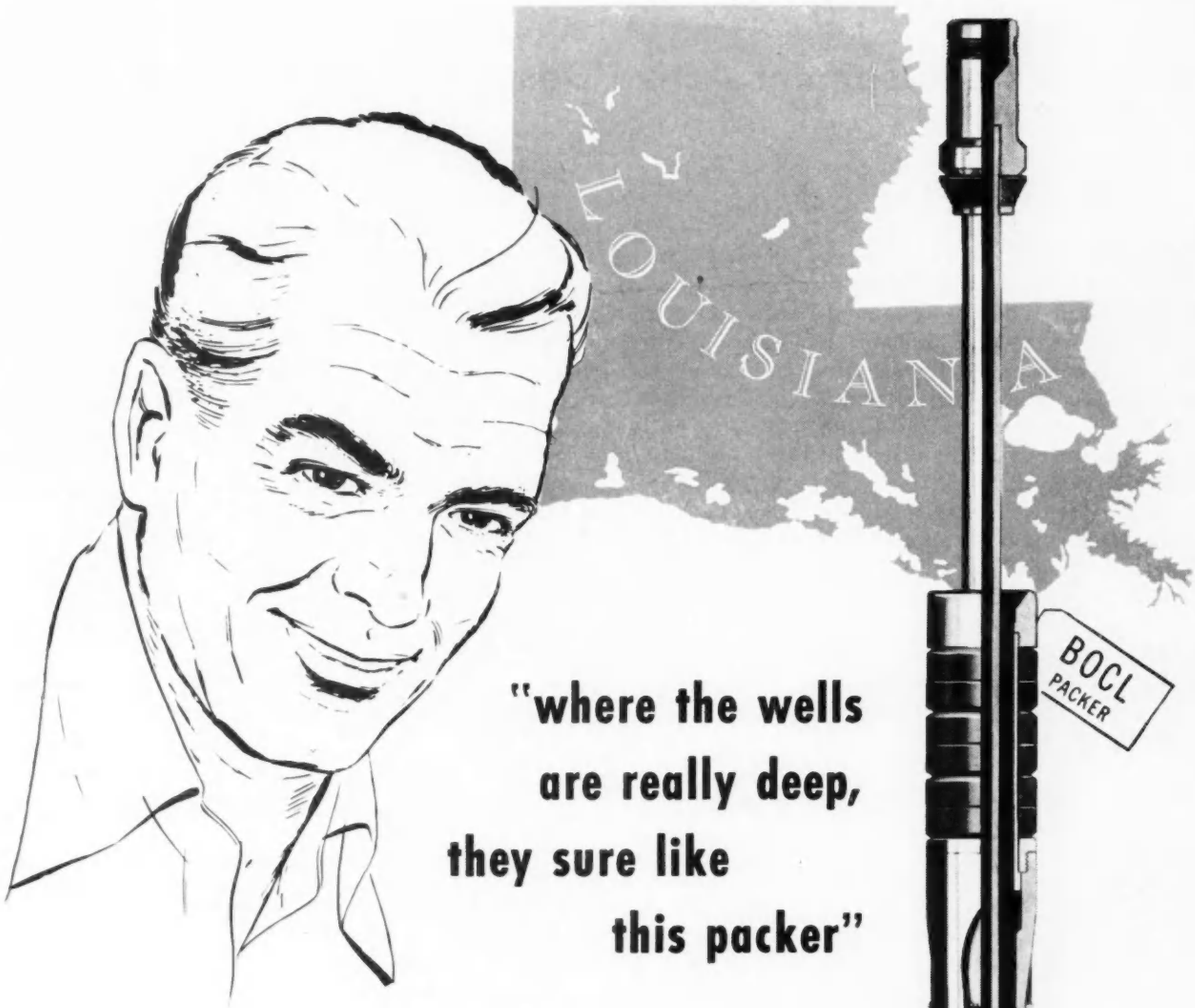
Spacing Won't Cut Into Royalties

Land and mineral royalty owners in North Dakota need not be concerned with the highly technical matter of well spacing patterns.

Under North Dakota's rules and regulations for conservation of oil and gas, passed December 1, the allowable production from a given farm or tract will be the same regardless of well spacing.

Irrespective of spacing programs, production will be allotted on the basis of 40-acres. For instance, wells drilled in fields with 80-acre spacing patterns will be allowed to produce twice as much oil as wells in fields developed on 40-acre spacing.

Therefore, it will not matter to land and royalty owners how many wells are drilled on each 80 acres, as in any case they will receive the same amount of royalty oil from the property.



"where the wells are really deep, they sure like this packer"

"Down along the bayous, where anything short of 10,000 feet is shallow well digging — the men there tell me this BOCL packer is doing a wonderful job on those deep producers.

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"Of course, the BOCL has all the other Lane-Wells features, too — the dovetailed slips that *can't* get out to foul up a pulling job, the friction-proofed slip backs, the free-wheeling cage and the generous by-pass — just like all the other Lane-Wells packers. And believe me, they use lots of those, too, in Louisiana.

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Tidelands Development Active Despite Row Over Law

Development of the submerged lands off the U. S. coast is under way and showing successful results, although offshore activity probably is retarded to some extent by the current litigation challenging constitutionality of the new Submerged Lands Act, which was signed by President Eisenhower May 22, 1953.

At the middle of December Monterey Oil Company and Humble Oil & Refining Company jointly announced the discovery of an offshore oil field at Newport Beach, Calif. Their Newport 1, the discovery well, bottomed at 4445 feet, was brought in December 12, pumping 250 barrels per day of clean 20° A.P.I. gravity oil.

Monterey was operator, and a first well was spudded on September 23, drilled to 7112 feet, and then plugged back to 900 feet. A second well was drilled from this depth to 4518 feet and plugged back to 4445 feet. A string of 7-inch casing was cemented at 4280 feet, and a perforated liner was set in the oil sand interval between 4258 and 4443 feet. Another well was due to be spudded immediately on an adjacent site.

After a two year period of inactivity because of controversy between federal and state governments over ownership of the "tidelands," drilling rigs are again running in the Gulf of Mexico and are showing some impressive results. Oil companies have accelerated both exploration and drilling. Seismic fleets are out "shooting" the Gulf bottom, and nearly as many offshore drilling rigs are making hole as the maximum of the past. The states of Texas and Louisiana in recent months have been receiving remarkably high bonuses for state leases of the submerged lands.

A few companies did not entirely cease operations during the tidelands title controversy, having continued seismic work. Since the question was settled by enactment of the new law, geophysical work has been intensified. For 1954, active drilling programs are scheduled in fields that have already been discovered, and there will also be a substantial amount of drilling on prospects heretofore undrilled.

So far there have been no truly "offshore" discoveries along the coast of Texas, but Louisiana has about 30 offshore oil and gas fields. In those fields about 220 wells have produced oil and distillate, and 23 gas wells have been completed and shut in for lack of market. The producing wells had yielded about 26 million barrels of oil and distillate by the middle of 1953. Besides the productive wells, about 130 dry holes have been drilled off the Louisiana coast.

Currently, about 15 offshore wells are being drilled in Louisiana, and an increase in drilling is in prospect for 1954. In one field, South Pass Block 24, for instance, Shell Oil Company proposes to drill 26 wells in 1954, including 3 exploratory wells to seek new pay sands in untested fault blocks. The same company also has planned a very active exploration program in 1954 in the Main Pass Block 69 field. Those fields are in the comparatively shallow waters bordering on the Mississippi River delta, and portions of the fields range out to almost three miles from land.

Important Discovery in Australia

West Australian Petroleum Proprietary Ltd. has discovered oil in an isolated section of Australia's West Coast about 600 miles north of Perth.

Discovery sands, at a depth of 3605-3620 feet, yielded a high grade waxy crude. The formation was tested for 25 hours during which the crude flowed at a rate of 23 barrels an hour through a one-quarter inch bottomhole choke.

The well, Rough Range 1, appears to be the country's first commercial producer. It was an exploratory venture drilled to begin testing of more than 300,000 square miles held under long-term concession from the State of Western Australia. Spudded in on Sept. 5 by a Brown Drilling Company contract drilling crew from Long Beach, California, the wildcat was drilled on a site selected after more than two years of detailed geologic and geophysical work, and its discovery climaxes a search for oil in this region which dates back to the 1930's.

Future plans for development of the concessionary areas include deeper drilling of the discovery well to test deeper geologic formations, and the drilling of more wells.

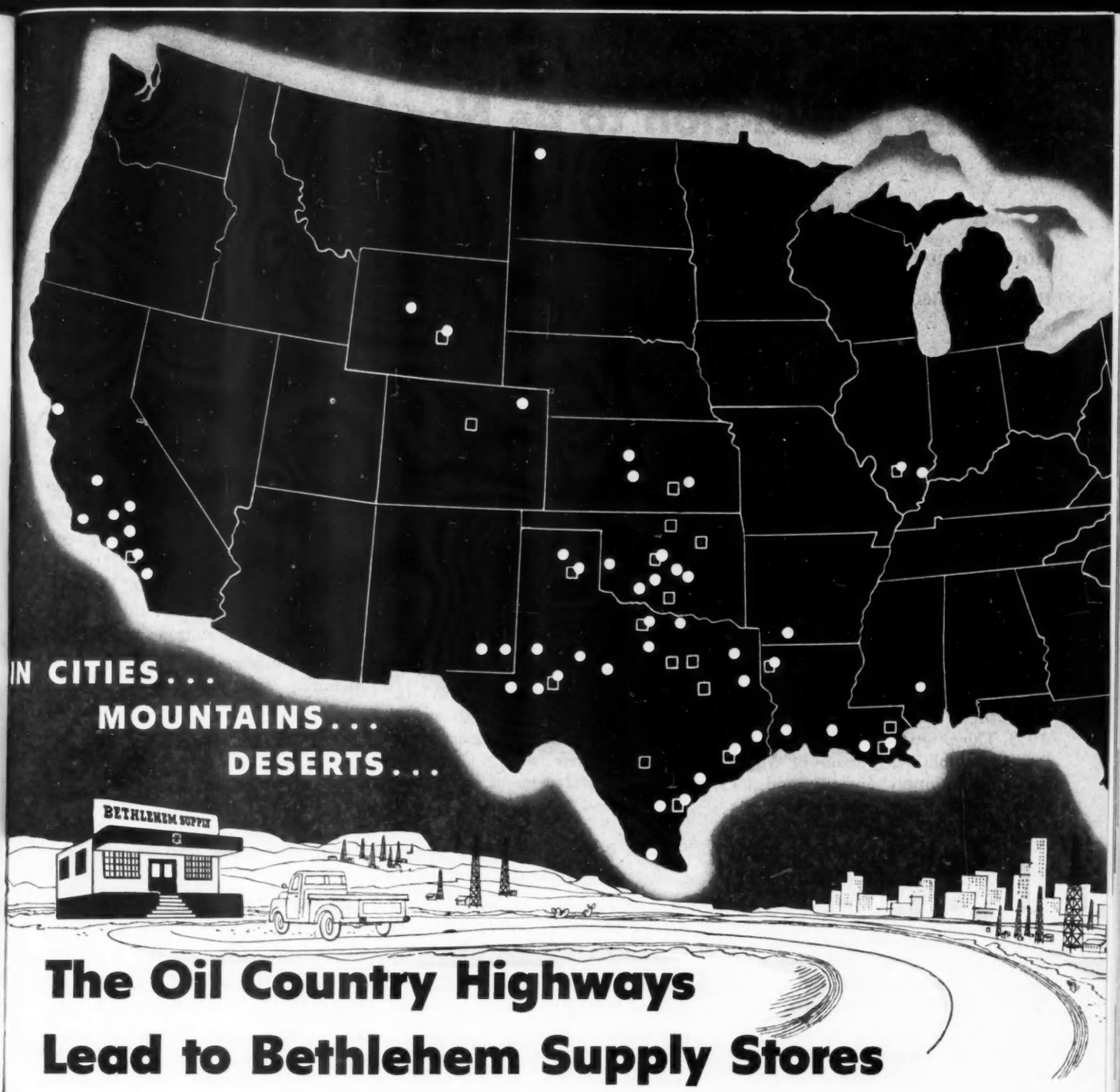
West Australian Petroleum, Ltd., is an organization formed to explore the concessionary areas, in which an 80 percent interest is held by California Texas Corp. and 20 percent by Ampol Petroleum Lt. Standard Oil Company of California has a 50 percent interest in Caltex.

Significance of the discovery is indicated by the fact that Australia now is using about 100,000 barrels of petroleum products daily, all of which must be imported. Imports come primarily from the Persian Gulf and Indonesia.

Gas for Millions

Increased underground "warehousing" of natural gas is foreseen. Millions of natural gas users will now be better served as a result of extensive developments by gas companies of natural gas underground storage facilities in the U. S.

Such "warehousing" of natural gas has been increased by nearly five times in the past 10 years. Two hundred and seventy underground storage projects were operating in 1941. In 1952 a total of 1290 were reported. Piped in during mild weather when demand is low, this gas will provide heat this winter for approximately 13 million homes sheltering 43 million people.



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Higher Production to Be Needed in 54

• Greater demand to require domestic production increases of 1.1 percent for crude and 6.6 percent for natural gasoline.

• Bureau of Mines forecast allows for 5 percent increase in total imports.

• Total demand to be up 2.9 percent, with domestic use 4 percent higher, but exports off 19.9 percent.

By L. J. LOGAN, WORLD OIL Staff

DOMESTIC PRODUCERS will have markets in 1954 for 1.1 percent more crude petroleum and 6.6 percent more natural gasoline and allied products than their estimated production in 1953. This prospect is indicated by the recently published Bureau of Mines forecast of supply and demand for 1954. The forecast appeared in the Bureau's Monthly Petroleum Forecast No. 221, covering December, 1953, and all of 1954. Also included were figures on supply and demand for 1953, partly estimated.

The increases in production are foreshadowed by the prospect of a 2.9 percent increase in total demand for all oils in 1954, as compared with 1953.

While domestic production will increase somewhat, imports of crude and products will also be up—by 5 percent. Resulting in a 2 percent increase in new supply.

This figure is less than the expected 2.9 percent increase in demand for the reason that the forecast allows for an increase of only 8 million barrels in stocks (all products, none crude), whereas in 1953 considerable new supplies went into storage, as stocks rose 33 million barrels (10 million crude and 23 million products).

The forecast for 1954 includes crude production of 6,556,000 barrels daily and production of other light oils of 710,000 barrels per day, representing increases of 1.1 percent and 6.6 percent respectively compared with 1953. Imports are estimated at 1,096,000 barrels daily, a gain of 5.0 percent.

The forecast of total demand in 1954 is 8,340,000 barrels daily, including exports of 310,000 barrels daily and a domestic demand of 8,030,000 barrels daily. Compared with 1953, total demand is 2.9 percent greater, total exports are about 20 percent less (a decline of 36 percent for crude and 17 percent for products), and domestic demand is 4.0 percent greater.

The gain in domestic demand includes increases of about 5 percent for gasoline, over 9 percent for distillate fuel oil, 4 percent for kerosine, and 3 percent for miscellaneous products, while a decline of 2 percent is estimated for residual fuel oil.

The large increase for distillate fuel oil is based mainly on the assumption of normal weather as compared with the mild weather of 1953. It is expected that heavy fuel oil requirements will show a moderate decline in industrial and railroad uses.

The domestic demand for gasoline, including aviation gasoline and the amount of low grade gasoline blended in jet fuel, should show a further substantial increase, the Bureau of Mines predicted. —**The End**

U. S. Bureau of Mines 1954 Forecast of Supply and Demand

(Millions of Barrels)

ITEM	FORECAST, 1954, BY QUARTERS				Forecast 1954 Year	Estimated 1953 Year	Percent Diff.
	First Quarter	Second Quarter	Third Quarter	Fourth Quarter			
Production, Total	**657.0**	**655.0**	**667.0**	**673.0**	**2,652.0**	**2,611.0**	**+ 1.6**
Crude	593.0	592.5	602.5	605.0	2,393.0	2,368.0	+ 1.1
Other Oils	64.0	62.5	64.5	68.0	259.0	243.0	+ 6.6
Imports, Total	**102.0**	**94.0**	**95.0**	**109.0**	**400.0**	**381.0**	**+ 5.0**
Crude	57.0	61.0	65.0	67.0	250.0	238.0	+ 5.0
Refined	45.0	33.0	30.0	42.0	150.0	143.0	+ 4.9
New Supply	**759.0**	**749.0**	**762.0**	**782.0**	**3,052.0**	**2,992.0**	**+ 2.0**
Change in Stocks	**—38.0**	**+31.0**	**+43.0**	**—28.0**	**+ 8.0**	**+33.0**	.....
Crude	.....	.....	.....	.....	.....	+10.0	.....
Products	—38.0	+31.0	+43.0	—28.0	+ 8.0	+23.0	.....
Total Demand	**797.0**	**718.0**	**719.0**	**810.0**	**3,044.0**	**2,959.0**	**+ 2.9**
Motor Fuel	295.0	347.0	353.0	330.0	1,325.0	1,271.0	+ 4.2
Residual	165.0	134.0	127.0	155.0	581.0	598.0	— 2.8
Distillate	197.0	109.0	99.0	175.0	580.0	537.0	+ 8.0
Kerosine	47.0	22.0	21.0	46.0	136.0	133.0	+ 2.3
All Other	93.0	106.0	119.0	104.0	422.0	420.0	+ 0.5
Exports, Total	**29.0**	**32.0**	**28.0**	**24.0**	**113.0**	**141.0**	**—19.9**
Crude	3.0	3.0	3.0	3.0	12.0	19.0	—36.8
Refined	26.0	29.0	25.0	21.0	101.0	122.0	—17.2
Domestic Demand	**768.0**	**686.0**	**691.0**	**786.0**	**2,931.0**	**2,818.0**	**+ 4.0**
Motor Fuel	287.0	338.0	345.0	324.0	1,294.0	1,233.0	+ 4.9
Residual	160.0	129.0	123.0	151.0	563.0	574.0	— 1.9
Distillate	190.0	101.0	92.0	170.0	553.0	506.0	+ 9.3
Kerosine	46.0	20.0	20.0	45.0	131.0	126.0	+ 4.0
All Other	85.0	98.0	111.0	96.0	390.0	379.0	+ 2.9
Daily Averages (Thousands of Barrels)							
Total Production	7,300	7,198	7,250	7,315	7,266	7,153	+ 1.6
Imports	1,133	1,033	1,032	1,185	1,096	1,044	+ 5.0
Change in Stocks	—423	+341	+467	—304	+22	+90	.....
Total Demand	8,856	7,890	7,815	8,804	8,340	8,107	+ 2.9
Exports	322	352	304	261	310	386	—19.7
Domestic Demand	8,534	7,538	7,511	8,543	8,030	7,721	+ 4.0
Runs to Stills	7,138	7,092	7,171	7,223	7,156	7,014	+ 2.0
Demand Domestic Crude	6,589	6,511	6,549	6,576	6,556	6,470	+ 1.3

Too many soups spoil the cook

The independent business man has many problems to face each day, problems connected with each of the many phases of his business. The officers of The National Bank of Commerce are qualified by training and experience to assist you in finding a solution to many of these problems. This experience can be put to work for your company when you make The National Bank of Commerce your bank. Complete, modern banking facilities are available for all our industrial depositors.

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MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

U. S. Wells Completed in November and First Eleven Months, 1953

STATE or DISTRICT	NEW WELLS COMPLETED AND FOOTAGE DRILLED											DETAILS FOR JANUARY-NOVEMBER					Rigs in Operation		
								TOTAL NEW WELLS			Total Footage November, 1953	New Wells			Footage				
	Oil	Dist.	Gas	Dry	Water Input	Gas Input	Water Disposal	Nov., 1953	Oct., 1953	Nov., 1952		1953	1952	Percent Diff.	1953	1952	Nov., 30, 1953	Oct., 31, 1953	Nov., 30, 1952
Alabama				9				9	10	8	42,369	98	64	+ 53.1	501,891	391,490	7	7	6
Arizona												6	2	+200.0	19,960	10,755	1	1	2
Arkansas	24		1	35				60	62	39	239,992	489	394	+ 24.1	1,829,939	1,467,653	41	48	36
California	135		5	43				183	269	207	825,407	2,336	2,267	+ 4.4	10,357,274	9,679,813	280	261	253
Colorado	25			43				68	58	53	364,634	641	443	+ 44.7	3,319,026	2,355,293	53	72	40
Florida				2				2	1		14,930	31	7	+342.9	200,367	45,407	3	3	3
Georgia				2				2	2		5,495	9			24,804		3	2	
Idaho												4			22,748				3
Illinois	145			92				237	276	236	618,288	1,976	1,971	+ 0.3	4,945,228	4,876,511	265	254	192
Indiana	35			59				94	127	174	144,475	1,202	1,248	— 3.7	2,005,369	2,230,657	179	182	179
Kansas	161		18	130			2	311	322	307	1,097,804	4,090	3,896	+ 5.0	14,198,875	13,516,940	436	435	442
Kentucky	37		16	39				92	106	103	183,865	1,079	1,088	— 0.8	2,115,585	2,210,850	95	91	111
Louisiana	171	5	42	94		1		313	280	213	1,853,763	2,476	2,192	+ 13.0	17,012,162	14,522,541	270	270	237
North Louisiana	94		18	53				165	148	123	515,768	1,118	1,214	— 7.9	3,977,713	4,672,487	56	64	56
South Louisiana	77	5	24	41		1		148	132	90	1,337,995	1,358	978	+ 38.9	13,034,449	9,850,054	214	206	181
Maryland									1	2		5	34	— 85.3	19,715	136,053	1	1	4
Michigan	27		1	31				59	60	41	140,170	567	581	— 2.4	1,456,125	1,571,654	89	97	88
Mississippi	10	3		26				39	53	29	260,549	379	313	+ 21.1	2,606,583	2,255,675	32	34	38
Missouri												25	29	— 13.8	20,645	30,090	1	1	4
Montana	5			16				21	43	36	116,540	390	281	+ 38.8	1,728,246	976,982	55	41	61
Nebraska	7		1	18				26	19	15	125,656	300	227	+ 32.2	1,545,527	1,132,728	13	15	16
Nevada												8			11,115		3	1	
New Mexico	45		56	17				118	124	89	669,502	1,345	1,015	+ 32.5	7,609,512	5,596,934	165	168	178
New York	50				31			81	81	88	113,011	853	994	— 14.2	1,189,911	1,379,842	102	107	108
North Carolina												1			1,570				
North Dakota	10		1	19				30	23	18	168,102	242	78	+210.3	1,744,080	656,812	26	31	33
Ohio	53		18	30	2			103	84	106	206,782	908	915	— 0.8	1,847,123	1,970,484	213	195	163
Oklahoma	335	4	25	162	9		2	537	613	450	1,777,946	6,539	5,174	+ 26.4	22,876,117	19,545,534	620	568	595
Pennsylvania	65		6	1	54	11		137	148	144	224,680	1,497	1,557	— 3.9	2,574,686	2,635,168	276	271	250
South Dakota				5				5	2		15,899	21	5	+320.0	95,509	20,531	2	5	3
Tennessee	1							1			1,134	2			3,403				5
Texas	755	25	51	621	12			1,464	1,529	1,266	6,561,098	15,533	16,178	— 4.0	70,913,788	77,626,321	1,441	1,375	1,345
Dist. 1 South Central	42		3	33				78	96	51	247,681	788	715	+ 10.2	2,520,061	2,109,137	32	38	35
Dist. 2 Middle Gulf	26	1	5	35				67	65	77	414,550	718	762	— 5.8	4,424,260	4,851,207	50	51	54
Dist. 3 Upper Gulf	70	11	4	77				162	131	140	1,075,603	1,527	1,625	— 6.0	10,271,782	10,805,223	142	129	131
Dist. 4 Lower Gulf-S.W.	57	11	8	53				129	176	120	707,041	1,685	1,482	+ 13.7	9,599,835	7,899,519	87	89	104
Dist. 5 East Central	10		2	15				27	16	19	110,771	258	323	— 20.1	1,043,063	1,610,955	15	13	17
Dist. 6 Northeast	17	1	12	18				48	46	30	260,610	465	472	— 1.5	2,760,705	2,897,552	65	51	43
Dist. 7-B North Central	127		5	139				271	288	240	897,376	2,882	2,530	+ 13.9	9,361,407	7,924,410	157	130	143
Dist. 7-C West Central	50	1	1	37				89	104	122	459,639	1,204	1,896	— 36.5	5,946,827	11,148,176	170	145	141
Dist. 8 West	159		1	60	1			221	245	193	1,200,080	2,151	2,936	— 26.7	12,292,323	17,271,149	355	350	335
Dist. 9 North	153		3	144	11			311	311	239	983,030	3,352	2,910	+ 15.2	11,105,084	9,429,464	256	271	267
Dist. 10 Panhandle	44		7	10				61	51	35	204,717	503	527	— 4.6	1,588,441	1,679,529	112	108	75
Utah	1		2	5				8	9	8	34,461	75	72	+ 4.2	399,657	465,138	17	24	29
Washington																	1	1	
West Virginia	3		26	3				32	50	43	93,020	548	527	+ 4.0	1,535,966	1,560,241	198	210	182
Wyoming	60		2	30				92	96	67	459,965	782	590	+ 32.5	3,945,119	2,953,725	159	168	83
Total United States	2,160	37	271	1,532	108	12	4	4,124	4,448	3,742	16,359,537	44,487	42,142	+ 5.6	178,677,625	171,821,822	5,047	4,939	4,689
Total Western Canada	133		17	59			2	211	192	173	849,279	2,049	1,744	+ 17.5	8,454,995	7,116,367	170	167	171

Completions Near Record

November's 4124 wells bring 11-months' total to 44,487, 5.6 percent above 1952.

A TOTAL OF 4124 new wells was completed during November to bring this year's drilling campaign to within one month of a new all-time record. By the time December's wells are tabulated, the year's tests will total 48,000 for the first time in the industry's history.

In the first eleven months of this year, drillers completed 44,487 wells in the U. S. which was 2345 wells or 5.6 percent more than the 42,142 recorded in the same period of 1952.

Footage drilled in this year's wells totaled 178,677,625 in the first eleven months and that was 4 percent more than the 171,821,822 represented in last year's wells. Wells totaling 5.6 percent more accounted for only 4 percent more footage. Of course, the answer is a slight decline in average depths of the two periods' wells. This year, each well was carried to a depth of 4016 feet on the average, while last year the overall average was 4077 feet.

Contrary to most years in the past, Texas' drilling rates did not reflect the U. S. picture as a whole. This year's activity in Texas has been down by 4 percent, while the U. S. drilling has been up more than 5 percent. In eleven months, a total of 15,533 new wells were drilled in Texas, while a year ago the total had stood at 16,178.

The No. 2 drilling state, Oklahoma, has seen a gain of 26 percent in its drilling operations this year. New wells have totaled 6539 in Oklahoma against last year's 5174. Kansas completed 4090 for third place in the nation. A year ago the count had been 3896, and that shows that this year's activity has topped that by 5 percent.

Louisiana edged California out of fourth place with its 2476 new wells. A year ago only 2192 had been drilled, which means that wells in that state have gained a very formidable 13 percent. California's operations have increased, but still not enough to boost the state above fifth position—a total of 2366 wells this year against last year's 2267.

Anadarko Basin's East Flank Promising

- **More oil and gas pools indicated.**
- **Seismograph work, subsurface mapping, and other geological techniques are essential to discover structures and stratigraphic traps.**
- **Multiple producing horizons enhance the possibilities.**

By RALPH W. DISNEY, University of Oklahoma, Norman, Okla.

RECENT OIL developments along the eastern flank of the Anadarko Basin call for a closer study of the area, especially that section located south of Oklahoma City. This is particularly true since commercial gas-condensate and oil production has been developed from the Simpson Group of Ordovician Age. This is due to operators penetrating below the Wilcox, a practice which was adopted in recent years and with splendid results, as will be shown later.

This article and the accompanying maps are primarily designed to present a general picture of the oil geology of the area. The three-dimensional maps are more or less an experiment in the hope that they will reveal the regional geology with greater clarity and without burdening the reader with myriads of geological data.

The 3-D maps are actual subsurface contour maps, the contour interval being 100 feet. The vertical scale does not diminish in the third-dimension, but the horizontal scale diminished slightly. One sees at a glance that the Oklahoma City field is in the highest structural position, and that the regional dip is southwest, accentuated by the prominent north-south fault, one of the largest in the area delineated by these maps. The viewer must imagine that he is standing somewhat west of this area, and that he is about 10 or 15 miles south and about 5000 feet below sea level, so that his line of vision would be horizontal with the Oklahoma City structure in the extreme northern part.

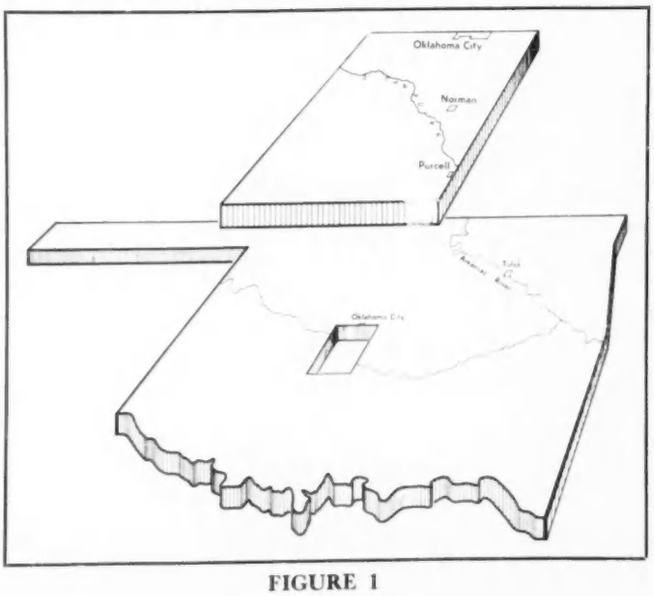


FIGURE 1

Development records show that by the late 1920's only about 10 wells had been drilled in the general area and none below 3500 feet. Since the surface rocks are Permian in age these wells barely reached the upper Pennsylvanian and consequently were dry holes. The first well in the Oklahoma City field was drilled in December, 1928, and penetrated the Pennsylvanian series for a successful completion in the Wilcox. Seven years after the Oklahoma City boom the Moore field was discovered in the middle 1930's, and not until 1943 was any significant production found, when the West Moore field was opened. The discovery well at West Moore was running so much lower than the Oklahoma City field that little hope for a successful completion was entertained by the majority of observers, and only a handful were present at the drill stem test which indicated production. From 1943 until the present time activity has continued to increase, until now there is a total of 24 fields, six of which are only one-well pools (See Pool Map, Figure 2).

As previously stated, rocks of Permian age outcrop on the surface throughout the area. They are generally non-resistant shales, except for sandstone lenses found in the Hennessey shale and the Chickasha-Duncan formation of the Enid Group. They offer poor formations for the mapping of the surface geology. Furthermore, these outcrops reflect no sub-surface structures, in the commonly accepted sense, except in the Oklahoma City area. They do indicate a regional dip of approximately 50 feet per mile to the west; thus, commonly practiced surface geological methods have proved useless.

Furthermore, there are at least three major layers of geology, each representing a cycle of sea advance and deposition of sediments, uplift and retreat of the sea, and subsequent erosion. This means that the sub-surface structures are buried beneath younger sediments deposited after many of these structures were formed. In addition, the thinnest Pennsylvanian rocks are approximately 5000 feet thick over the Oklahoma City structure. The thickest, close to 8000 feet, are found in the extreme south-

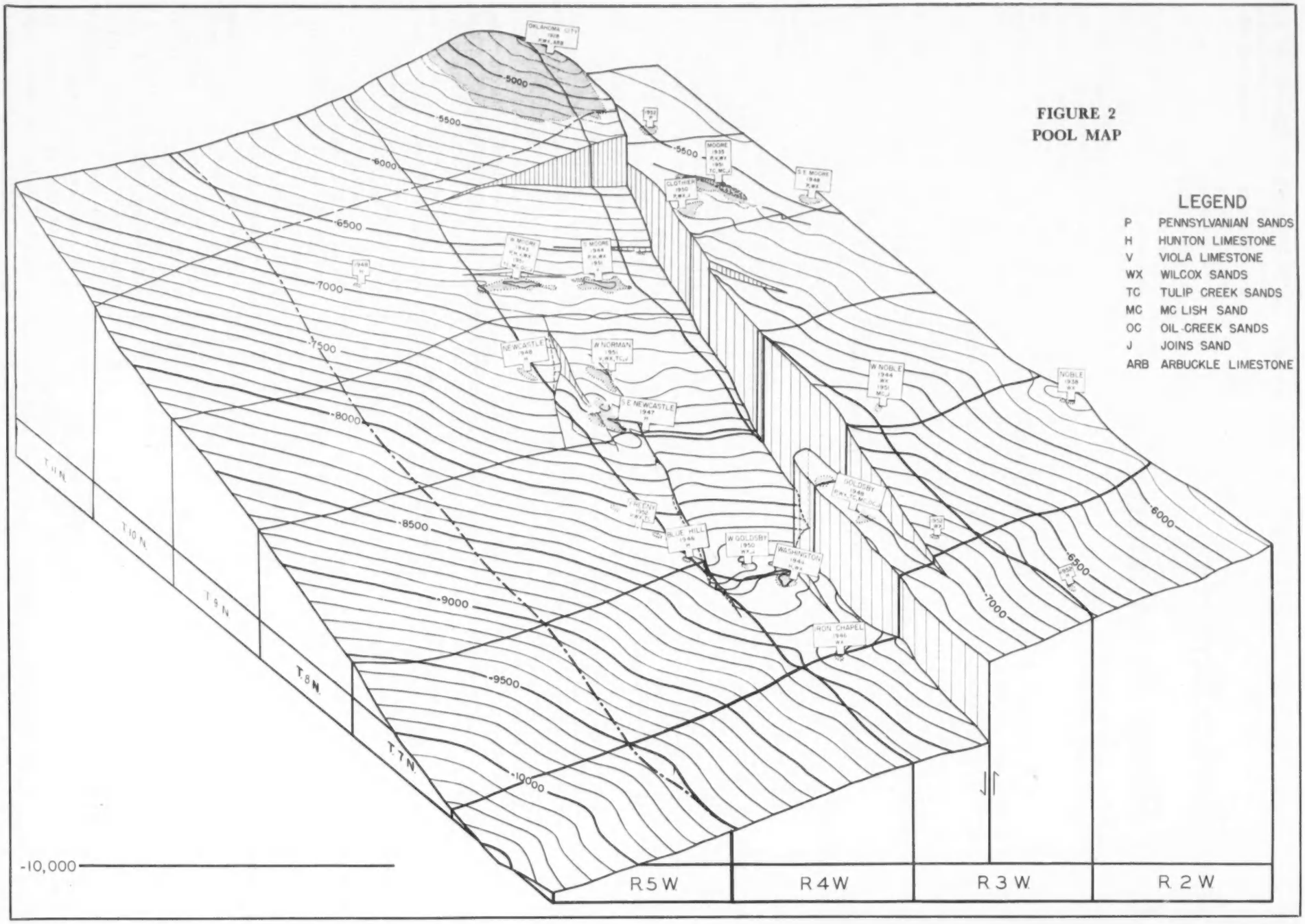
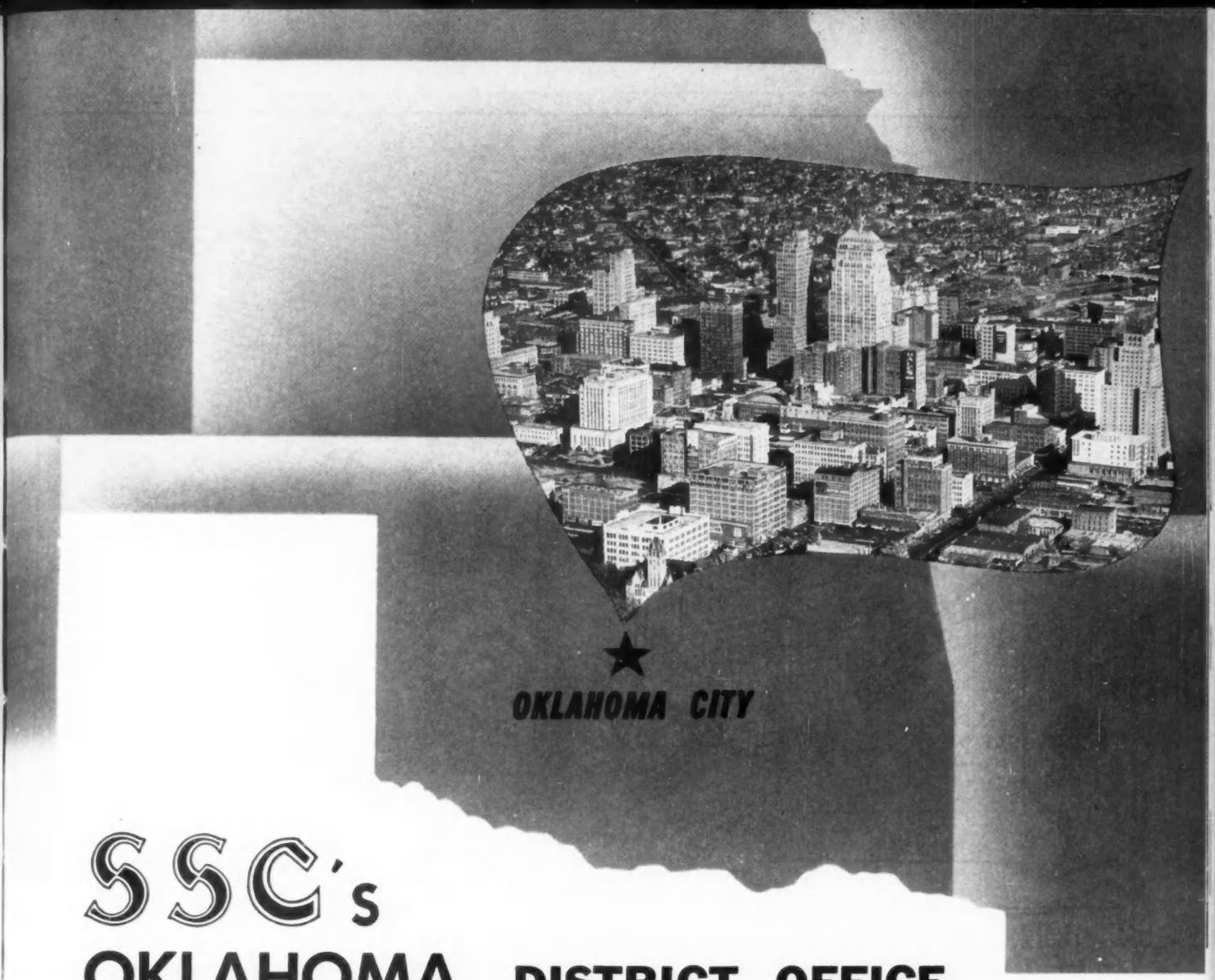


FIGURE 2
POOL MAP



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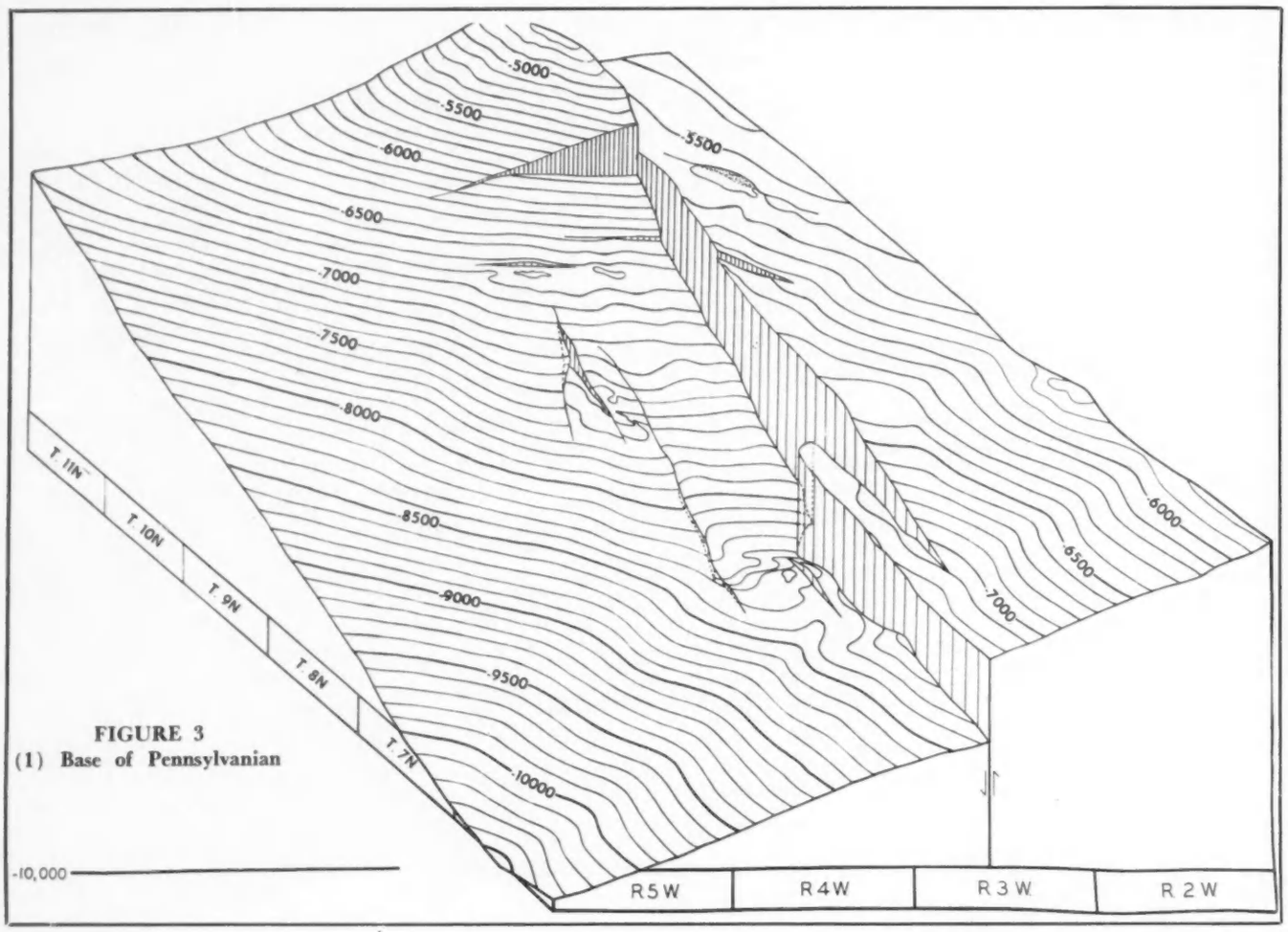

FIGURE 3
(1) Base of Pennsylvanian

west portion of this area. No horizon has been found productive above the "Hart" sand, or Cherokee Shale Group equivalent, except in the Oklahoma City field. (The northeastern Oklahoma term given to the Pennsylvanian sand production is Bartlesville, which is probably erroneous.) Because of the depth of the producing Pennsylvanian horizons and the occurrence of layered geology, the shallowest horizon which has meaning when contoured, is the Base of the Pennsylvanian. (See Base of Pennsylvanian Map, Figure 3.)

Oil exploration in this area, therefore, resolves itself in certain geological considerations. The first and most obvious is that oil in commercial quantities is already being produced. Production is obtained throughout 2600 feet of section, from the lower Pennsylvanian down into the lowermost Simpson which is middle Ordovician in age (See Geologic Column, Figure 4). The second consideration lies in the presence of multiple source beds. This area is recognized to be along the east flank of the mammoth Anadarko Basin which contains extremely thick and complete sections of marine basin sediments. And third, these rich source beds are in contact with major unconformities and porous carrier beds, so that the migration of petroleum during times of movements of the earth's crust was out of the depths of the Anadarko Basin into the more shallow fringe areas, such as the area now under discussion. The final geological consideration embodies the accumulation of petroleum. Suitable reservoir rocks total hundreds of feet in thickness, and porosities average above normal. Structures which are producing are not large in areal extent, but some of the production is the most prolific in Oklahoma. Multiple producing hori-

About the Author

RALPH W. DISNEY is a native Oklahoman. Before entering the University of Oklahoma, he attended schools in Tulsa, Okla., Washington, D. C., and Ann Arbor, Mich. After two years at the university, Disney was inducted into the Army Air Corps in which he served as an aerial photographic interpreter. Upon discharge from the Army, he returned to the University of Oklahoma to resume his studies in geology. He has a B.S. and an M.S. from the university. During his graduate work, Disney was a graduate assistant, a part-time instructor, and in 1949 was appointed an instructor in geology. Since that time he has taught elementary geology and subsurface geology to geology majors and petroleum engineers.

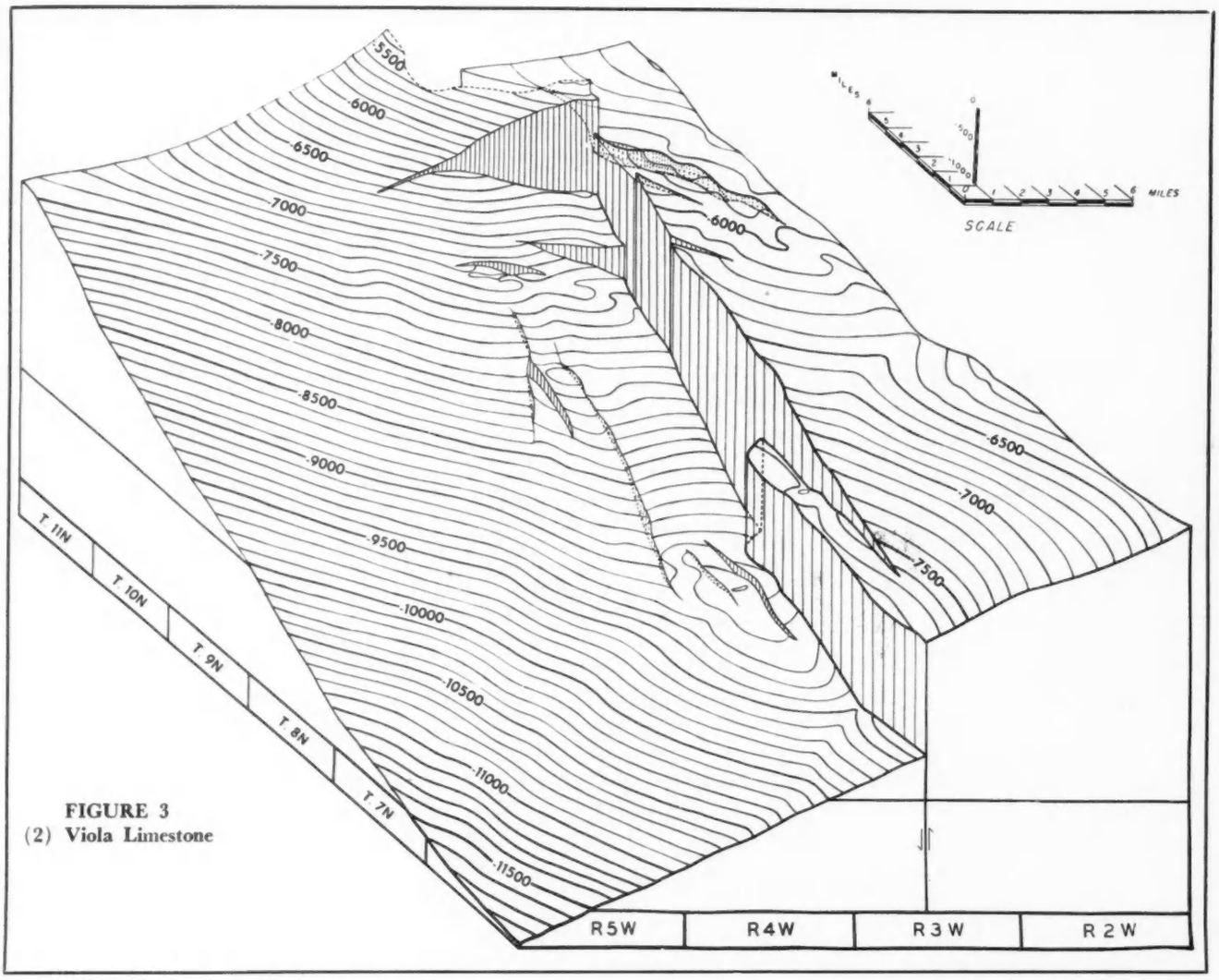

FIGURE 3
(2) Viola Limestone

zons are a rule rather than an exception.

Faulting plays a major role in creating suitable traps for petroleum. The faults pictured on the accompanying maps represent but a small fraction of the total number actually present.

Anticlines, noses, and structural terraces, closely associated with faults, are widespread throughout the area and, again, many more are undoubtedly present than have been mapped.

Not only do faults and structures offer traps for the accumulation of petroleum, but favorable stratigraphic conditions exist in the Deese sands or the Cherokee Group sands of the lower Pennsylvanian and in the top of the Hunton limestone and in the lower Viola limestone and dolomite.

The problem, then, resolves itself into the actual exploration for the reserves which we know are present.

Subsurface mapping is an invaluable aid, but it is not enough for the discovery of new fields. Seismograph work appears to be the answer. New methods of interpreting seismograph data more accurately are being developed. Almost all production in recent years has been discovered on the basis of seismograph work. With the aid of other geological techniques, such as electric log interpretation, correlation studies, recognition of stratigraphic relationships, structural and historical studies, local areas in which seismographing should be carried on can be fairly well defined.

One of the most significant discoveries in the area in recent years is the Goldsby area. In 1948, on the basis of seismograph work for Joe Faust and Floyd Kerns, geologists of Oklahoma City, the Danciger Oil Company drilled in De Cordova 1, 35-8N-3W, offsetting a dry hole drilled to the second Wilcox in 1947. This well found the first successful Lower Simpson production anywhere north of the Lindsay field, again with the exception of Oklahoma City. The Lower Simpson is here defined as that part of the Simpson which lies below the second Wilcox sandstone. In the region south of Oklahoma City, the Lower Simpson is from 600 to 700 feet thick and includes the Tulip Creek sand, the McLish sand, the first and second Oil Creek sands, and the Joins sand. Each of these sands are productive in the Goldsby area. (NOTE: The nomenclature for this section differs with various operators.)

Another successful Lower Simpson venture involved the redrilling of two wells, formerly dry holes. The geology in this instance was by Harry Holland, an independent consultant at Norman, Oklahoma, working for the Producers Development Company. The wells are productive in the Lower Viola, the Wilcox, the Tulip Creek and Joins. As a result of this venture one "dry hole" has flowed 67,703 barrels of condensate and 557,338,000

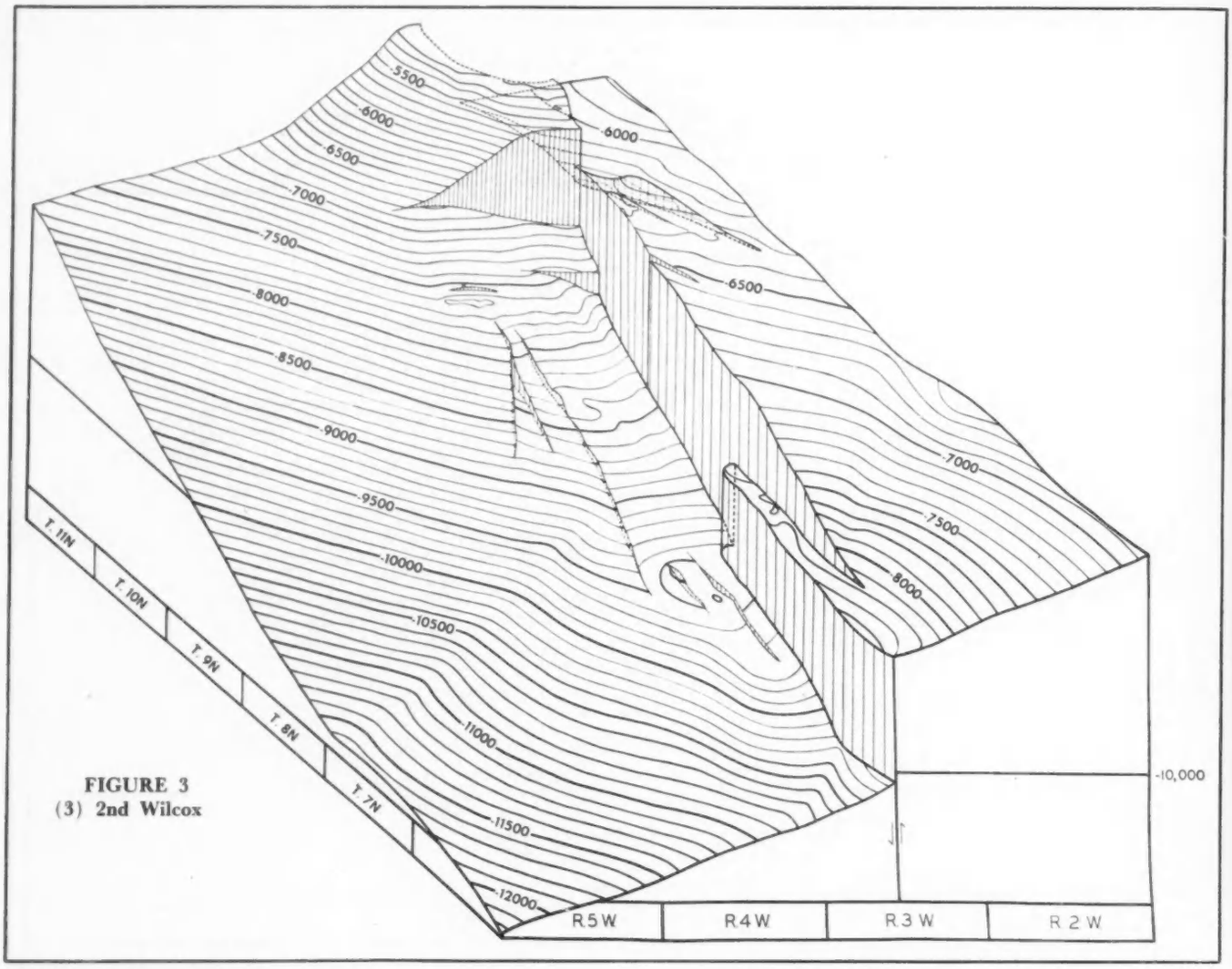

FIGURE 3
(3) 2nd Wilcox

cubic feet of gas in 25 months, from perforations in the second Wilcox. These discoveries led to other deeper drilling with excellent results. Almost all recent wells have been drilled through the Lower Simpson, a practice which is becoming general throughout the area. One Simpson producer has made 375,000 barrels of condensate and oil in less than four years from the Wilcox and Tulip Creek sands alone. It still has other Simpson sands from which to produce after the current zones are depleted. It is expected that other Simpson zone producers, already completed or to be drilled, will do as well as the one just mentioned. There also is a very good possibility that Deese sand production will be found over a large extent of the area and not be confined to isolated pools.

All things considered, the writer believes that the oil possibilities along the eastern flank of the Anadarko Basin and especially in the area south of Oklahoma City, are very promising. —**The End**

GEOLOGIC COLUMN

AGE	FORMATION	Maximum Thickness in Feet
	Surface	Surface
PERMIAN	Enid Group	2,500
	Pontotoc	
PENNSYLVANIAN	Hoxbar * "Hart" sand * Deese Bartlesville sand * 5th Deese sand * 6th Deese sand Upper Dornick Hills	1,000 — 8,000
	Lower Dornick Hills Springer Group	
MISSISSIPPIAN	Caney shale Mississippi Lime Woodford shale	395
DEVONIAN	Hunton Lime Group Frisco chert * Bois d'Arc Lime & Dolomite Haragan lime	440
SILURIAN	Henry house lime * Chimneyhill lime	200
ORDOVICIAN	Sylvan shale Viola Lime Fernvale lime * Trenton lime & dolomite	140 400
	Simpson Group Simpson Dense * Simpson Dolomite * 1st Wilcox sand * 2nd Wilcox sand Bromide * Tulip Creek sand * McLish sand * 1st Oil Creek sand * 2nd Oil Creek sand * Joins sand	1,740
	* Arbuckle Lime (Produces only in Oklahoma City)	(Only top penetrated)

* Indicates production in this area.

FIGURE 4

It was soon after Columbus discovered America that King Charles V of Spain initiated a movement to build a canal between the American Continents for shorter oceanic travel to the Far East. But it was not until 1903 — under determined and skilled supervision of the United States — that plans actually began to take shape for the Panama Canal. Through ten years of construction that followed, the many obstacles to be overcome seemed next to impossible. Nevertheless, the crews assigned to that tremendous task remained steadfast in purpose and on August 3rd, 1914, the first steamer passed through the "Big Ditch." After nearly 400 years, the dream of the Panama Canal was a reality.

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How to Plan an Exploration Campaign

- Size up the area
- Choose the best method
- Estimate the cost
- Select proper personnel

By E. B. NOBLE, Petroleum Consultant, Los Angeles, Calif.

EXPLORATION AS applied to oil finding covers both the search for new fields in areas where subsurface conditions are practically unknown, and the re-working of older districts for deposits overlooked in previous prospecting. The first kind of exploration is essentially a pioneering job; the second is more of a research problem. In each case careful planning is necessary. One calls for wide coverage in a relatively short time, followed by more careful examination of selected blocks, while the other needs concentrated effort in a relatively small area, with detailed analysis of existing records.

Exploration is "big business" and should be treated as such. Work can proceed only as long as management is willing to supply the necessary funds, and since time and costs are closely related, it is important to make a preliminary study of living and working conditions covering any area selected for exploration, so that the program will not be interrupted or slowed down by lack of mobile equipment, adequate supplies, or any other items that might have been anticipated by careful planning.

There are four logical steps involved in this planning:

1. Size up the area.
2. Choose the best method, or combination of methods to get the coverage and detail desired within the allotted time.
3. Estimate the cost.
4. Select the proper personnel.

Size Up of Area. Much can be learned about a new area by reviewing the literature covering the geology, weather, history, laws, social customs and political situation. If maps are available they will show which areas are accessible by existing roads, where new roads must be built, trails widened, or bridges constructed. Talking with people who have lived or worked in the area will help in understanding what constitutes good housing, what local foods can be counted on, what type of clothing is suitable, what appealed to them most and what they particularly disliked. Health of personnel is so important that all possible information should be obtained on the prevalence of dysentery, malaria, and other infectious or contagious diseases, and protective measures discussed with competent medical authorities.

It is desirable to know what supplies can be secured locally and what will have to be shipped in, and from where. This also applies to the supply of trained technicians and laborers.

In order to get an idea of the regional geology and the nature of the terrain, a careful study should be made of air photos, supplemented by observational flights over the area. This will indicate the relative amount of geological and geophysical work to be done, show where the work should start, where the emphasis should be placed and whether part of the area might be eliminated or disregarded during the early stages of the investigation.

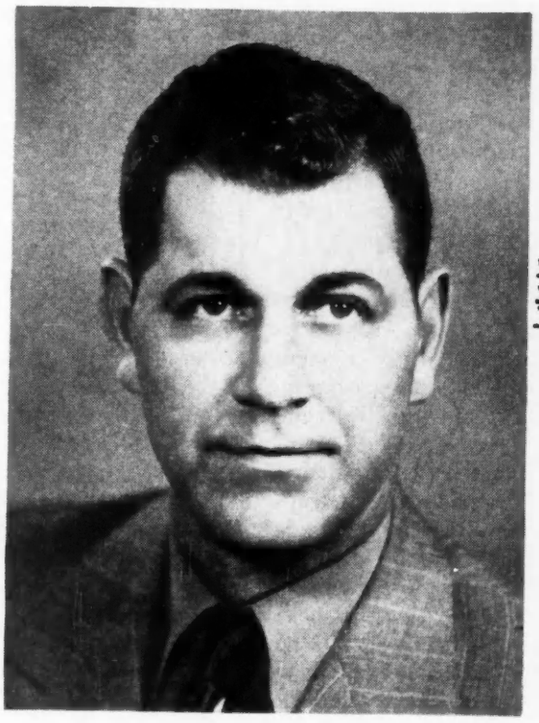
Part 1

It is desirable to indicate those portions of the area that are mountainous, hilly, rolling, or flat, and to use such further descriptive terms as rocky, swampy, wooded or sandy. These physical characteristics will determine the type of equipment needed; while the number and condition of the roads and trails, and the general distribution of towns and villages will determine the mode of transportation for personnel and supplies between headquarters and temporary field camps. Where trails are rough and travel slow, much working time will be lost if crews have to go much over 20 miles to work, which suggests that under these conditions camp sites should be spaced at about 40-mile intervals. Availability of water is important, as long hauls mean that more tank trucks and storage facilities will be needed.

The object of this preliminary study is to provide sufficient information to effectively plan that part of the program that pertains to transportation and the operation and maintenance of camps and supply lines.

Choice of Methods. There is no known formula nor "best method," the choice generally depending on experience in other areas. Geological and geophysical methods remain basically the same wherever they are used and there is no real difference in principle involved whether the crews are working in the dense rain forests of New Guinea, the marshes of south Louisiana, the open waters of the Gulf, the loose sands of the Arabian Desert or the frozen tundra of the Arctic Plains. It is simply a question of adapting equipment and operating technique to local conditions.

There seldom is any great difference of opinion among exploration men as to where geological field parties can operate effectively or where geophysical work is necessary. The difference comes when considering what type of geophysical approach to use. When a geological party is sent into the field to map structure or measure a section there



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is general agreement as to just what can be accomplished. On the other hand, when any one of the several recognized geophysical methods are considered for preliminary reconnaissance in new and entirely unknown territory, no one can predict with any degree of accuracy just what usable information will be obtained.

A decision as to what method to use is comparatively simple if regional studies suggest the presence of folded structure, compaction over basement highs, deep seated domes or even complicated fault traps. But in many of these areas, the oil may be accumulated in low relief features that are hard to define, in stratigraphic traps that are not readily found by geophysical work, or in reefs that are indefinite in shape and occurrence. Nobody yet knows enough about buried reefs to consistently locate the productive ones—certainly nobody knows just what the next one will look like or whether it will be porous in the right places. Some reefs look like a loaf of bread with shale draped over the top, some stick up like a sore thumb with no evidence of their presence a quarter or a half mile away, while others may be broad, flat-topped affairs and may be tilted with the regional dip so that the only chance of recognizing their presence would be the occurrence of a few erratic or steep dips near their edges.

In planning geophysical exploration of a vast new territory, it is usual practice to consider the use of the flying magnetometer, gravity meter, and reflection seismograph, in that order. In country where there is little or no surface expression, and where subsurface conditions are relatively unknown, the use of the flying magnetometer should receive serious consideration. While there is considerable difference of opinion as to just what usable information may be obtained, there seems to be general agreement that it will reveal the grain of the country and indicate the amount of basement relief. The per-acre cost of a magnetic survey of this kind is very little, but when large areas are involved (and this is usually the case) management may question the advisability of using the money for an airborne survey when ground crews are going to work the area anyway. The decision would probably be influenced by the company's previous experience with this method and whether they feel the information likely to be obtained will provide sufficient control to guide the seismic or ground crews and thereby make their work more selective.

About the Author

E. B. NOBLE, now a petroleum consultant with offices in the General Petroleum Building, Los Angeles, has spent the last 30 years in the exploration end of the oil business, a greater part of the time with the Union Oil Company of California as chief geologist, manager of exploration and general manager for Canada. His work has carried him into practically all of the oil districts of the U. S. as well as many parts of Central and South America, Mexico, Canada, and the Arctic. Noble graduated from Yale in 1916 and took post graduate work at the University of California in 1921. Prior to entering private practice he spent a year in New York City as petroleum consultant to the National City Bank.

The gravity meter is a good reconnaissance tool in many areas, especially where there are contrasting densities as in salt dome country or where there is sufficient subsurface relief. Its effectiveness might be questioned in areas of low subsurface relief, as, for instance, the plains of northern Alberta. The meter is affected by changes in the character of the basement rock, and it is generally good practice to run a magnetometer in conjunction with the gravity meter in order to distinguish those anomalies that reflect a change in the character of the basement rocks from those that are due to basement topography or structural uplift.

It is usual practice to check the better looking gravity anomalies by shooting or coreholing. In some places it is impossible to get usable reflections, and at times velocity variations in the near surface beds seriously affect the interpretation. If markers are shallow, core holes can be used and correlations made from ditch samples, cores or electric logs.

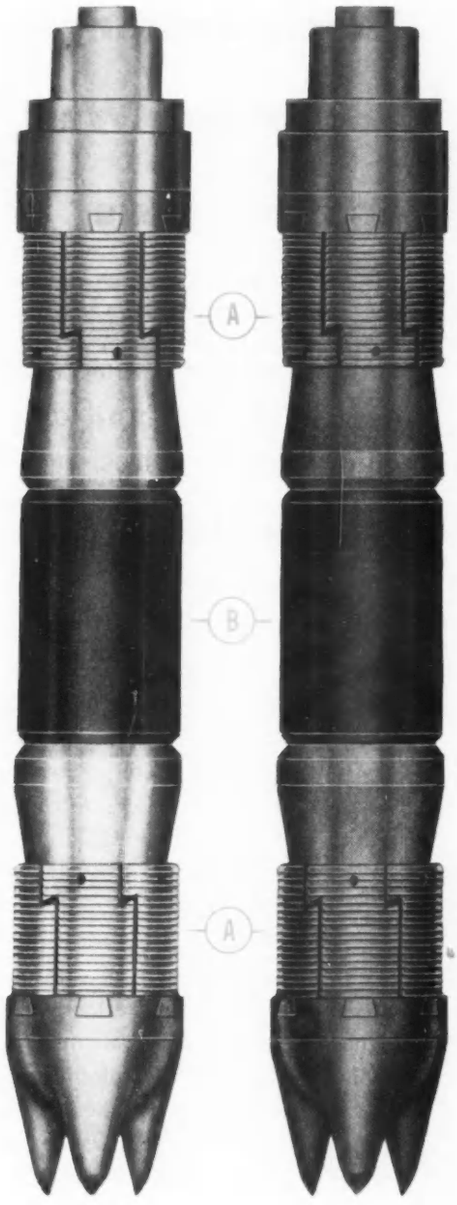
A question that often arises is whether to run gravity first or start right out with the seismograph. Preliminary gravity work may not be justified when physical conditions are such that the cost of cutting or bulldozing trails is relatively high and the trails do not fit the shooting pattern to be used.

In planning seismic work, the principal problem is to determine the most effective spacing and general pattern to be used. Spacing should be wide enough to give rapid coverage, and still close enough to catch any structure, reef, or other feature that might be present. In other words, the size of the sieve is important.

There are areas in any new district in which usable reflections cannot be obtained, and often considerable time is wasted in attempting to work these spots. In Saudi Arabia, one company has tried to solve this problem by using a bob-tailed crew of four men known as a "pioneer crew," which works out ahead of the other parties. Its job is primarily to find out how deep the shot holes should be drilled, what size charge is most effective, and to steer the line crews away from areas of no or poor reflections, until experience shows how they can be worked.

In the Peace River district of Alberta, there are extensive areas, especially near some of the rivers, in which reflections are particularly poor and where velocity variations in the upper few hundred feet of beds greatly affect the structural interpretation. The answer probably lies in shooting shallow refraction lines for velocity information or attaching an extra drill to each party to work out ahead of the crew, drilling holes to necessary depths annd shooting them for velocity control. In a district where geophysical features may have 50 feet to 75 feet of relief, it is easy to put a structure in or wipe it out according to the velocity information used. In certain cases of this sort in

Continued on Page 92



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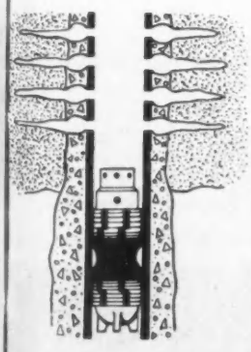

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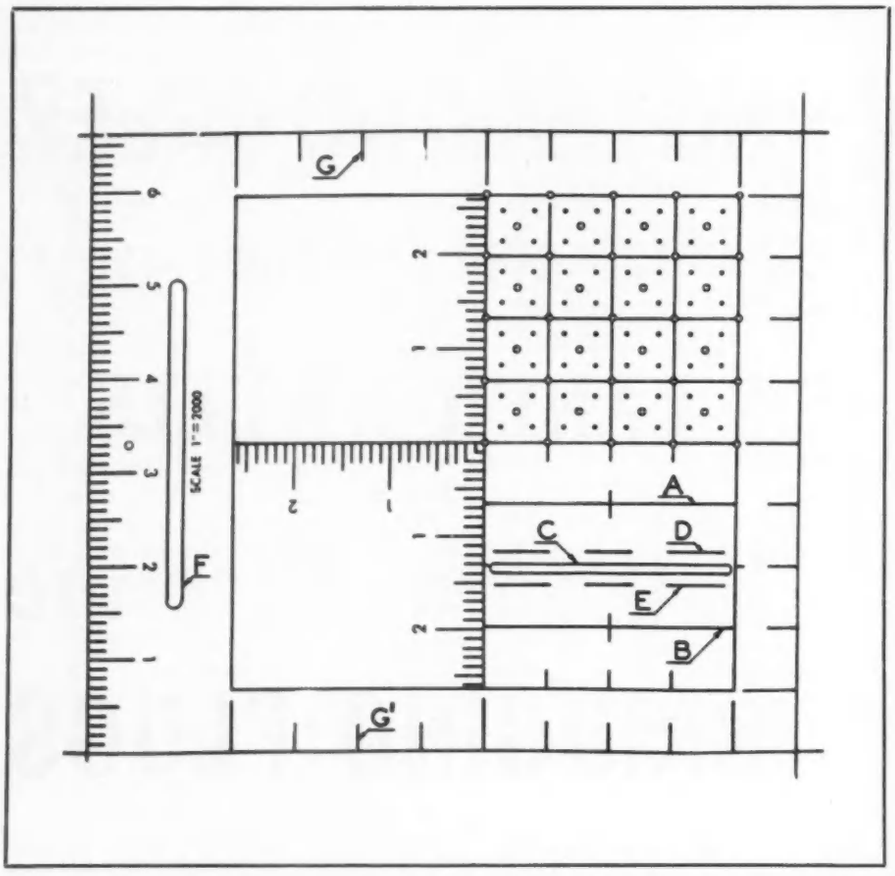

Fig. 1. Picture of simple drafting tool for spotting wells, outlining leases and farms and drawing guide lines on maps in sectionized country. The tool is made of plastic and is about four inches square.

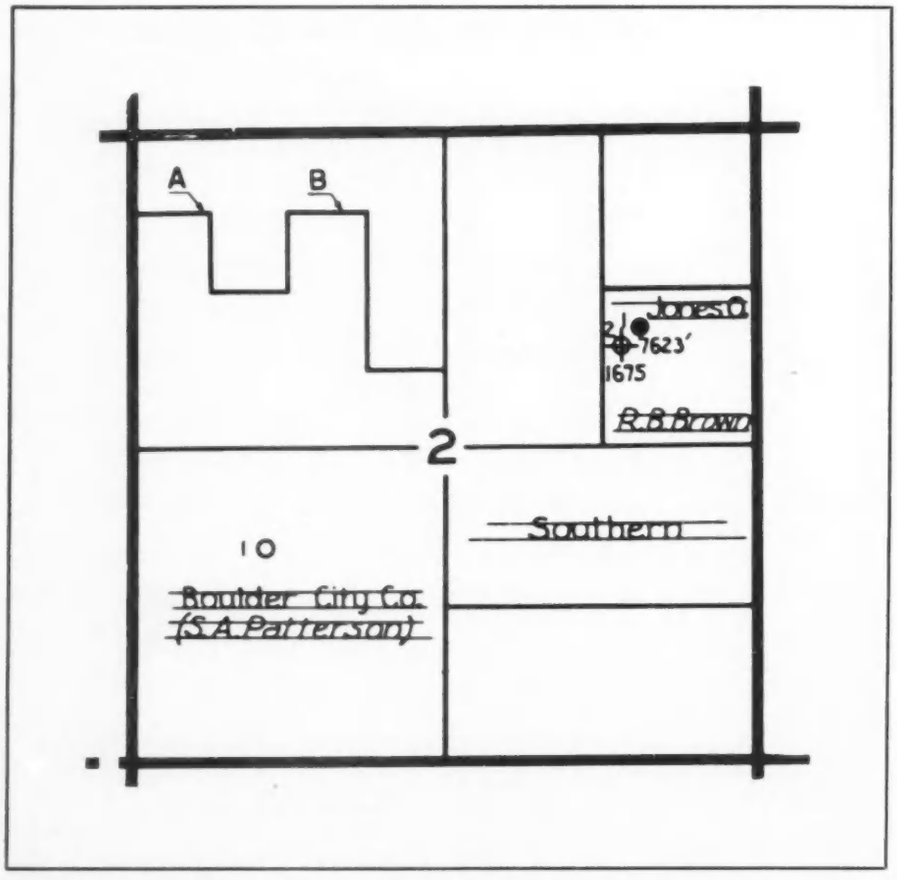

Fig. 2. Section of land used to illustrate how the drafting tool shown in Figure 1, operates.

Simple Drafting Tool Makes Well Spotting Easier

This timesaver can be used to spot wells, outline leases, and draw guide lines on maps.

By ANTHONY GIBBON,
WORLD OIL Staff

A SIMPLE drafting tool for spotting wells more accuratey and quickly has been devised by Fate Cupps, chief draftsman for Amerada Petroleum Corporation, Tulsa. The instrument reduces posting time about a third, as it eliminates the use of a regular scale, two triangles and a lettering guide. The instrument (born of necessity resulting from a shortage of draftsmen in the Amerada headquarters) is designed especially for draftsmen and geologists. It is made of plastic and is about four inches quare. Besides well spotting, the tool can be used for outlining leases and farms and for drawing guide lines for the names of the operators and farms on maps in sectionized country.

The tool is shown in Figure 1 and the following examples explain how it operates.

1. Procedure to be used to spot a well location:

EXAMPLE 1. To locate a well in the center of the NW SE NE of a section—Place the instrument over the section so the quarter with the holes falls over the NE quarter of the section on the map in Figure 2. With a sharp pencil, make the desired location.

EXAMPLE 2. To locate a well in the center of the SW NW SE NE

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of a section—Proceed as in Example 1, locating a point in the center of the NW SE NE. Next, shift the dot located in the center of the SW NW SE NE *on the instrument* directly over the point located on the map. The first hole directly SW from this point will give the desired location.

EXAMPLE 3. To locate a well that is 1800 feet from the south line and 1120 feet from the west line of a section—Place the instrument so that the hole in the center of the section outline will be 1800 feet from the south line and 1120 feet from the west line of the section in Figure 2 by using the two scales simultaneously.

2. Procedure to follow in drawing guide lines for lower case letters for operator and farm names, thereby placing them in the proper place in a tract:

EXAMPLE 1. To draw lower case guide lines for a name to be in the center of the north half of the SE quarter of Figure 2—Place lines A and B, Figure 1, over the north and south lines, respectively, of tract. Draw guide lines with a sharp pointed pencil, using slot C.

EXAMPLE 2. To draw lower case guide lines for a name to be placed near the north line of SE NE of Figure 2—Place the broken line D on the north line of the tract. Draw guide lines as in Example 1.

EXAMPLE 3. To draw lower case guide lines for a name to be placed near the south line of the SE NE in Figure 2—Place the broken line E on the south line of the tract. Draw guide lines as in Example 1.

EXAMPLE 3. To draw lower case guide lines for a name to be placed near the south line of the SE NE in Figure 2—Place the broken line E on the south line of the tract. Draw guide lines as in Example 1.

EXAMPLE 4. To draw lower case guide lines for two names, one directly below the other in the SW quarter of Figure 2—Draw the guide lines for the top line of lettering. Next, shift the broken line D directly over the bottom guide line of the first line of lettering. The instrument is in the proper position to draw the guide lines for the second line of lettering.

Slot F is for drawing guide lines for capital letters. Slot C is ⅔ the height of Slot F.

3. Procedure to follow in blocking in a lease:

EXAMPLE 1. To block in the NW quarter of Figure 2 as shown—Use the lines projected on the outer edge of the instrument as follows: Place the instrument so that the projected lines G and G′ fall on the south line of Figure 2. The instrument is in the proper position to draw lines A and B in Figure 2. By using the same procedure, draw all other lines necessary.

The scale on the outer edge renders the instrument more useful. The instrument shown can be used on 1 inch, - 1000 feet, 1 inch - 2000 feet, and 1 inch - 4000 feet maps.

—The End.

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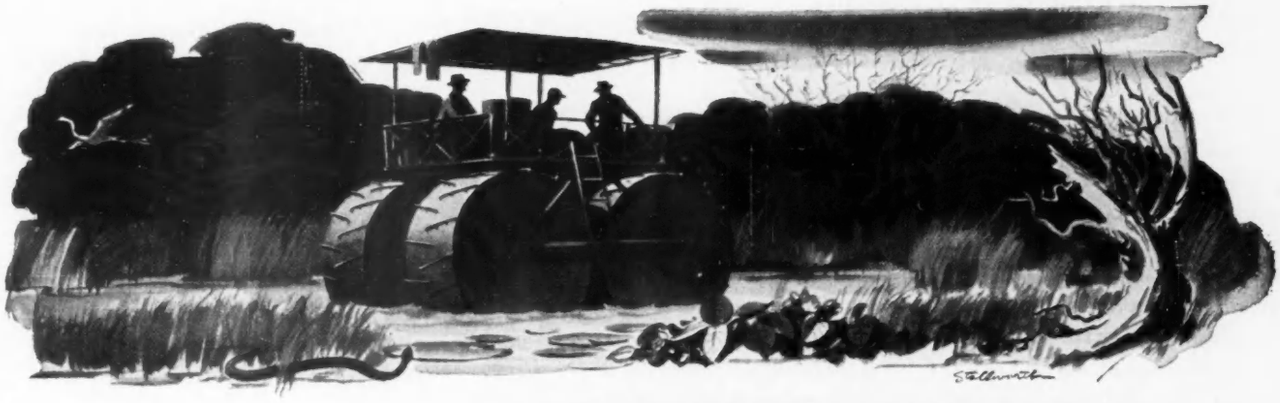

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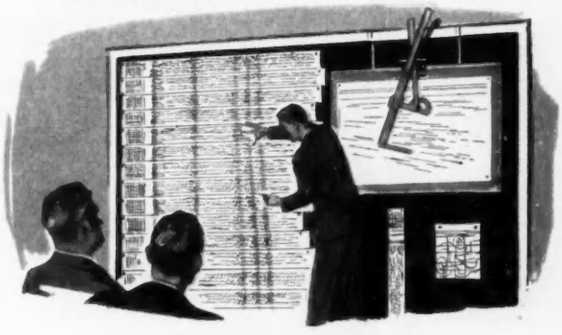

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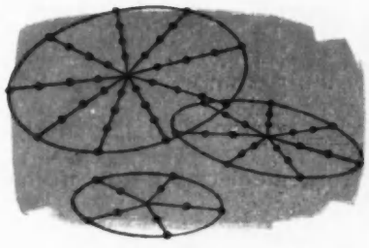

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How to Plan an Exploration Campaign

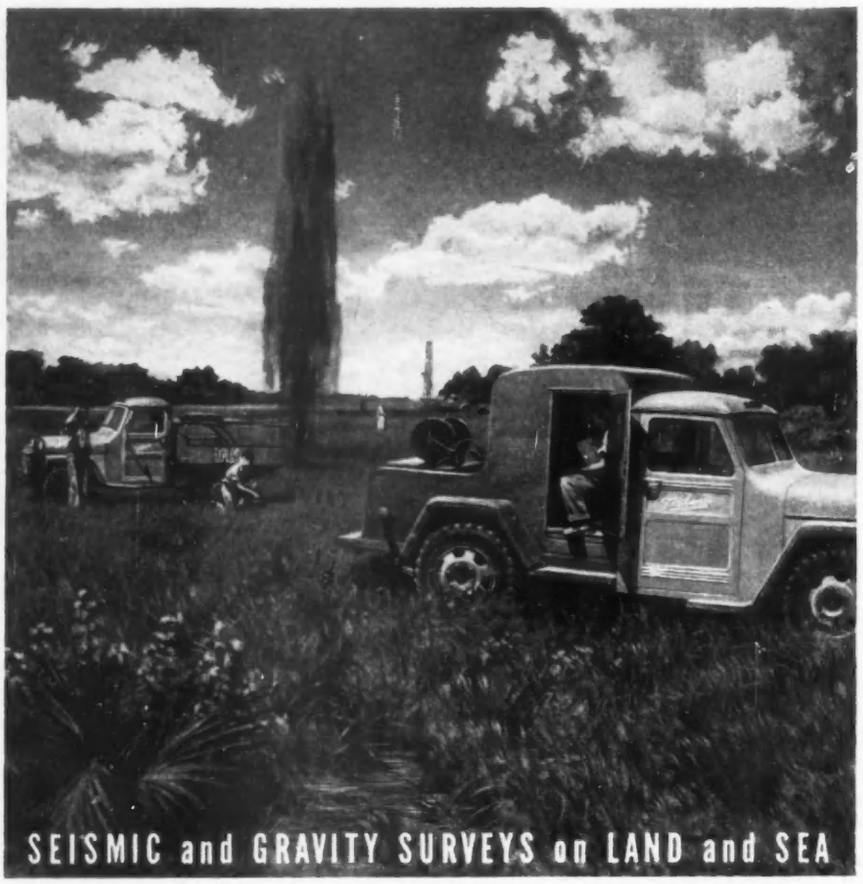
Continued from Page 86

northern Alberta, the value of supplemental core hole information has been recognized in completing the structural picture.

A sort of "chicken or egg" question often arises as to whether it is better practice in a new area to drill first for stratigraphic information or to shoot until some structural feature is found so that the structure and the section can be checked in the one operation. This is one of those "Monday morning quarterback" questions that can best be answered after the investigation is over. In the author's opinion it is generally good practice to drill a well for stratigraphic information early in the investigation, especially if there is likely to be a prolonged delay in finding a suitable structural location.

The land situation plays an important part in determining the method or procedure to be used. In a competitive area, rapid reconnaissance is called for in order to be in a position to select favorable lands before the other fellow gets them. Where large blocks are held under concession, reservation, permit or option, the problem is to evaluate these lands within the allotted time. In areas with heavy or increasing rentals, a company may be forced to do such rapid work that it fails to get effective coverage. Possibly it would have been better to have worked a portion of the area in detail and know something about it than to have done a sketchy job on the whole area and know practically nothing about it. On lands carrying drilling commitments, it may be necessary to double up or work the crews overtime in order to find suitable drillsites before the deadline. The various factors mentioned above have a direct bearing on the density of the shooting and the number of crews necessary to complete the assignment within the allotted time to the required degree of accuracy.

The choice of methods depends on experience gained in other areas, the competition for lands, obligations imposed by the terms of concessions and leases, restrictions due to seasonal working conditions and, last but not least, the amount of money available to do the job. **—End Part I.**



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Exploratory Drilling . . . in November and First Eleven Months, 1953-1952

State or District	MONTH OF NOVEMBER, 1953													FIRST ELEVEN MONTHS																
	Productive Tests									Total Productive	Unproductive Tests			Total Exploratory Tests	Productive Tests									Total Productive		Unproductive Tests			Total Dry		Total Exploratory Tests	
	New Fields			New Pays			Extens ons								New Fields			New Pays			Extensions										
	Oil	Dis.	Gas	Oil	Dis.	Gas	Oil	Dis.	Gas		Wildcats	New Pays	Outposts		Oil	Dis.	Gas	Oil	Dis.	Gas	Oil	Dis.	Gas	11 Mo. 1953	11 Mo. 1952	Wildcats	New Pays	Outposts	11 Mo. 1953	11 Mo. 1952	11 Mo. 1953	11 Mo. 1952
Alabama											7			7																	
Arizona																								1	2	75			75	33	75	35
Arkansas											18			18	10		1	12		4			1	28	21	125		1	126	100	154	121
California	5		1	3						9	33		1	43	19		6	28		6	15		1	75	85	394	1	30	425	393	500	478
Colorado	5									5	25			30	27	2	10	1		1	2			43	27	268			268	219	311	246
Florida											2			2												31			31	7	31	7
Georgia											2			2												9			9		9	
Idaho																										4			4		4	
Illinois				1			4			5	36			41	21		1	13			39			74	99	430			430	560	504	659
Indiana	1			1						2	28			30	26		2	3		1	6			38	46	340			340	332	378	378
Kansas	13		2	1			1		1	18	56			74	127		19	4			5		4	159	139	809			809	811	968	950
Kentucky	2									2	9			11	20		1				2			23	31	103			103	118	126	149
Louisiana	4	2	2	8	2	2				20	32		1	53	30	16	6	42	11	10	10	4	1	130	94	359		7	366	355	496	449
North Louisiana						1				1	22		1	24	5	4		5	1	2	7			24	37	191		5	196	211	220	248
South Louisiana	4	2	2	8	2	1				19	10			29	25	12	6	37	10	8	3	4	1	106	57	168		2	170	144	276	201
Michigan	1						1			2	18			20	11		4	1			5			21	32	231			231	220	252	252
Mississippi	1									1	19			20	11	2	3	7	1		2	1		27	21	177		6	183	148	210	169
Missouri																										10			10	16	10	16
Montana											10			10	10		2				1			13	10	105			105	75	118	85
Nebraska							1			1	10			11	17		3				4		1	25	16	129		2	131	116	156	132
Nevada																										8			8		8	
New Mexico	2		4	1						7	8			15	24		35	3	1	1	5		5	74	54	128			128	111	202	165
North Carolina																										1			1		1	
North Dakota			1							1	18			19	7		1	1			3			12	10	75			75	18	87	28
Ohio						1			1	2	1			3						1	2		4	7	10	13			13	29	20	39
Oklahoma	9		2				5		1	17	49			66	111	6	25	27	1	3	66	1	8	248	190	645			645	677	893	867
Pennsylvania																							1	1						2	1	2
South Dakota											5			5												21			21	5	21	5
Tennessee	1									1				1	1									1		1			1		2	
Texas	39	6	8	19	1	2	8	1		84	359			443	453	61	82	207	41	23	128	20	21	1036	912	3817		82	3899	3781	4935	4693
Dist. 1 S. Central	4		1							5	27			32	18	2	5	1	2	1	2	1		32	34	292		7	299	312	331	346
Dist. 2 Middle Gulf		1	1							2	23			25	15	9	14	9	5	2	5	1	5	65	77	246		5	251	270	316	347
Dist. 3 Upper Gulf	2	1	1	2	1	1				8	44			52	25	14	6	38	16	9	10	11	8	137	141	341		46	387	323	524	464
Dist. 4 L. Gulf-SW	2	4	1	9						16	27			43	38	25	24	58	15	7	2	4	4	177	109	436		4	440	369	617	478
Dist. 5 E. Central	1									1	9			10	4	1	1	2	1					9	7	104			104	116	113	123
Dist. 6 Northeast	3			1				1		5	11			16	12	3	1	6			1	1		24	18	134		2	136	117	160	135
Dist. 7-B N. Cent.	10		1	4						15	91			106	142		17	32		1	26	1	2	221	185	885		3	888	864	1109	1049
Dist. 7-C W. Cent.	3		1							4	20			24	49	6	6	14	1		8			84	90	316		2	318	343	402	433
Dist. 8 West	4			1			2			7	37			44	63	1	2	18	1	1	30			116	112	349		2	351	369	467	481
Dist. 9 North	10		2	2		1	6			21	67			88	85		6	29		2	43	1	2	168	138	704		11	715	673	883	811
Dist. 10 Panhandle											3			3	2						1			3	1	10			10	25	13	26
Utah			1							1	5			6	4		8				1			13	3	42			42	49	55	52
West Virginia																									1					3		4
Wyoming	8									8	16			24	31		4	3			1			39	17	120			120	137	159	154
Total U.S.	91	8	21	34	3	5	20	1	3	186	766		2	954	960	87	213	352	55	46	301	26	47	2087	1820	8476	1	128	8605	8317	10,692	10,137

Drilling Record Near

November exploratory rates ease off from previous month but still remain high.

By CECIL W. SMITH, WORLD OIL Staff

EXPLORATORY DRILLING rates in November eased slightly from the previous month, but activity still remained high. Tests completed in the first 11 months of 1953 totaled more than five percent over completions in the comparable period of 1952, and were apparently only a month away from setting a new all-time record for exploration.

A total of 954 tests were completed during November and that was a drop from the 1017 recorded during October. Drilling rates usually drop slightly in November, and that coupled with a slightly shorter period produce fewer completed wells.

In 11 months, the grand total of tests completed was 10,692, and that was 5.5 percent more than the 10,137 recorded in the same period of 1952. That was the year of the greatest exploratory drilling activity in history. So it appears that this year's campaign is only one month away from setting a new all-time peak.

November's efforts in the industry's search for new sources of oil and gas resulted in the opening of 125 new oil pools, and they were comprised of 91 new fields and 34 new pay horizons in older fields. A month earlier had accounted for only 105 new pools.

Summary of Results of Exploratory Drilling

ITEM	Nov., 1953	Oct., 1953	ELEVEN MONTHS January-November 1953	1952	Percent Diff.
Oil Discoveries	125	105	1,312	1,190	+ 10.3
New Fields	91	77	960	913	+ 5.1
New Pays	34	28	352	277	+ 27.1
Distillate Discoveries	11	5	142	124	+ 14.5
New Fields	8	2	87	105	— 17.2
New Pays	3	3	55	19	+189.5
Gas Discoveries	26	24	259	187	+ 38.5
New Fields	21	19	213	149	+ 43.0
New Pays	5	5	46	38	+ 21.1
Total Discoveries	162	134	1,713	1,501	+ 14.1
Extensions to Fields	24	42	374	319	+ 17.2
Oil Fields	20	33	301	269	+ 11.9
Distillate Fields	1	2	26	10	+160.0
Gas Fields	3	7	47	40	+ 17.5
Total Prod. Tests	186	176	2,087	1,820	+ 14.7
Dry Holes	768	841	8,605	8,317	+ 3.5
Wildcats	766	837	8,476	8,072	+ 5.0
New Pays			1	12	— 91.7
Outposts	2	4	128	233	— 45.1
Total Expltory Tests	954	1,017	10,692	10,137	+ 5.5
Percent Productive	19.5	17.3	19.5	18.0	
Percent Dry	80.5	82.7	80.5	82.0	

U. S. Discoveries in November

NEW FIELDS, NEW PAYS AND EXTENSIONS

CALIFORNIA—NEW OIL FIELDS

Kern County. A. M. Van Flick's USL-Van-Ray 1, in 22-28s-28e, flowed barrels from Vedder sand, Miocene 2690-2702 feet, 16.2-gravity, completed 11-2-53, TD 2702.
Unnamed field. Enterprise Oil Co.'s M & B 4, in 21-28s-20e, pumped 20 barrels from 1399-1587 feet, 13-gravity, completed 10-27-53, TD 1600.

Kings County. Reserve Oil & Gas Company's Orchard 48-20, SE SW 20-24s-18e, flowed 66 barrels from Kreyenhagen sand, Eocene 4390-4408, 9/64-inch, 40-gravity, completed 11-5-53, TD 5237.

Santa Barbara County, Casmalia Hills, West field. Golden Bear Oil Company's Dolcini 2, in 33-10n-35w, pumped 25 barrels from 1735-2135 feet, 10-gravity, completed 11-2-53, TD 2153.
Unnamed field. Slick-Moorman Production Co.'s Palmer Stendel 1-C, in 24-9n-33w, pumped 30 barrels from 2331-2934 feet, 10-gravity, completed 10-27-53, TD 3235.

CALIFORNIA—NEW OIL PAYS

Kern County, Edison Groves field. A. M. Dunn's DLK 1-A, in 28-29s-29e, pumped 15 barrels from Chanac sand, Miocene 1175-1320 feet, 16-gravity, completed 10-30-53, TD 1356.
Midway Sunset field. Oceanic Oil Company's C. C. M. O. G-1-8, in 8-32s-23e, flowed 204 barrels from Republic sand, Pliocene 2690-2800 feet, 13/64-inch, 23.4-gravity, completed 11-5-53, TD 2800.

Ventura County, Torrey Canyon field. Union Oil Company's Torrey 92, in 5-3n-18w, flowed 103 barrels from 12,737-13,479 and 13,989-14,888 feet, 29.6-gravity, completed 11-2-53, TD 14,989.

CALIFORNIA—NEW GAS FIELD

Solano County, Liberty Cut field. Arcady Oil Co.'s Fahn 1, SW NW 9-5n-3e, flowed 2.0 million from 4128-38 feet, 10/64-inch, completed 11-18-53, TD 5000.

COLORADO—NEW OIL FIELDS

Adams County. R. A. Goodall's Schug 1, SW SW SE 15-1s-57w, pumped 25 barrels oil and 20 barrels water from "J" sand, Upper Cretaceous 5521-25 and 5539-42 feet, completed 11-1-53, TD 5600.

Logan County. Shell Oil Co.'s Budin 1, SW SE 2-8n-55w, flowed 243 barrels from Dakota sand, Upper Cretaceous 5271-75 feet, 20/64-inch, completed 11-12-53, TD 5406.
Unnamed field. Shell Oil Co.'s Peterson 1, SE NW 18-8n-53w, pumped 98 barrels oil and 24 barrels water from Dakota sand, Upper Cretaceous 5005-10 feet, completed 11-5-53, TD 5065.

Morgan County. Petroleum Inc.'s Clar 1, SE NE NW 24-1n-58w, flowed 288 barrels from "D" sand, Upper Cretaceous 5650-58 feet, completed 11-18-53, TD 5870.

Weld County, Southwest Roggen field. Spears and Colorado-Wyoming Oil's Henry Zimbleman Jr. 1, C SE NE 22-2n-63w, flowed 100 barrels from "D" sand, Upper Cretaceous 7038-63 feet, ⅛-inch, completed 11-20-53, TD 7135.

ILLINOIS—NEW OIL PAY

Clark County, Weaver field. W. W. Dayton's Cole 3, SE SW SE 19-11n-10w, pumped 20 barrels from Borden sand, Mississippian 1564-79 feet, completed 11-24-53, TD 2089.

ILLINOIS—OIL FIELD EXTENSIONS

Clay County, Flora field. W. H. Krohn's Chambliss 1, SW NE 19-3n-7e, 1-mile southeast extension, pumped 128 barrels from McClosky lime, Mississippian 2981-86 feet, completed 11-10-53, TD 2987.

Edwards County, Parkersburg Consolidated field. Calvert Drilling Inc.'s N. Johnson 1, NW NW NE 1-1n-10e, ¾-mile extension, pumped 71 barrels oil and 17 barrels water from McClosky lime, Mississippian 3251-58 feet, completed 11-10-53, TD 3354.

Gallatin County, Inman, East Consolidated field. Coy Oil, Inc.'s M. S. Wiggers 1, SW NW NW 33-7s-10e, Old Well Worked Over, 1 mile northwest extension, pumped 16 barrels oil and 10 barrels water from Aux Vases sand, Mississippian 2775-92 feet, completed 12-1-53, TD 2920.

Hamilton County, Bungay Consolidated field. E. J. Cunningham's S. L. Moore 1, NW NE SW 10-4s-7e, ¾-mile extension, pumped 40 barrels oil and 30 barrels water from Lower O'Hara lime, Mississippian 3336-50 feet, completed 11-10-53, TD 3454.

INDIANA—NEW OIL FIELD

Dubois County, Jasper, North field. Elmer Novak-Aaron Karchmer's Fuhrman 1, SW NE SE 13-1s-5w, pumped 25 barrels from Cypress sand, Mississippian 470-485 feet, TD 748.

INDIANA—NEW OIL PAY

Dubois County, Huntingburg, South field. Mulzer Bros.'s Irvin J. Gehlhausen 1, NW NE SW 29-3s-5w, flowed 8 barrels from O'Hara lime, Mississippian 1036-40 feet, TD 1100.

KANSAS—NEW OIL FIELDS

Barton County, Hawkins, Northwest field. Murfin Drilling Co.'s Byers 1, SE SE NW 33-18s-13w, pumped 479 barrels from Arbuckle lime, Ordovician 3416-34 feet, TD 3434.

Butler County. Rex & Morris' Young 1, NW NE NE 15-29s-5e, pumped 30 barrels from Bartlesville sand, Pennsylvanian 2837-49 feet, TD 2849.

Decatur County. M. B. Armer et al's Schultz 1, NE NE SW 5-3s-29w, pumped 243 barrels from Lansing lime, Pennsylvanian 3744-50 feet, TD 3931.

Edwards County, Enlow field. Natural Gas & Oil et al's Enlow 1, SE NE NW 9-24s-16w, flowed 379 barrels from Lansing lime, Pennsylvanian 3736-43 feet, TD 4294.
Unnamed field. Branine & Holl's Skalsky 1, CS½ SE NE 22-24s-16w, pumped 109 barrels from Kansas City lime, Pennsylvanian 3800-35 feet, TD 4584.

Gray County. United Producing Co.'s Salmon 1, C SE NW 29-29s-27w, pumped 10 barrels from Lansing lime, Pennsylvanian 5103-11 feet, TD 6500.

Greenwood County. Charles Miller's Mathers 1, NE NE SW 31-22s-10e, pumped 25 barrels from Bartlesville sand, Pennsylvanian 2514-52 feet, TD 2552.

Pratt County, Gereke field. Rine Drilling Co. et al's Gereke 1, SW NE SE 12-26s-15w, potentialed 3000 from Mississippi lime, Mississippian 4276-86 feet, TD 4594.

Rice County, Crawford field. Eddie Riggs' Little 1, SE SE SE 12-18s-7w, pumped 50 barrels from Misener sand, Mississippian 3194-3201 feet, TD 3587.

Rooks County, Northampton, Southeast field. Francis Oil & Gas Co. & Geo. Kaiser's Wilson 2-C, NW NE SE 35-9s-20w, potentialed 3000 from Arbuckle lime, Ordovician 3776-87 feet, TD 3787.
Unnamed field. Petroleum, Inc.'s Dick 1, NE SE NW 29-10s-19w, pumped 240 barrels from Arbuckle lime, Ordovician 3752-60 feet, TD 3760.

Stafford County, Newell field. National Cooperative Refinery Association's Newell 1, NW SW NW 7-25s-11w, potentialed 3000 from Viola lime, Ordovician 3913-16 feet, TD 4137.
Slade field. National Cooperative Refinery Association's Slade 1, SW SE SW 23-25s-12w, flowed 108 barrels from Lansing lime, Pennsylvanian 3819-24 feet, TD 4218.

KANSAS—NEW OIL PAY

Lyon County, Welch-Mohr field. K & E Drilling's Moher 1, NW SW NW 29-20s-10e, pumped 5 barrels from Bartlesville sand, Pennsylvanian 2312-14 feet, TD 2321.

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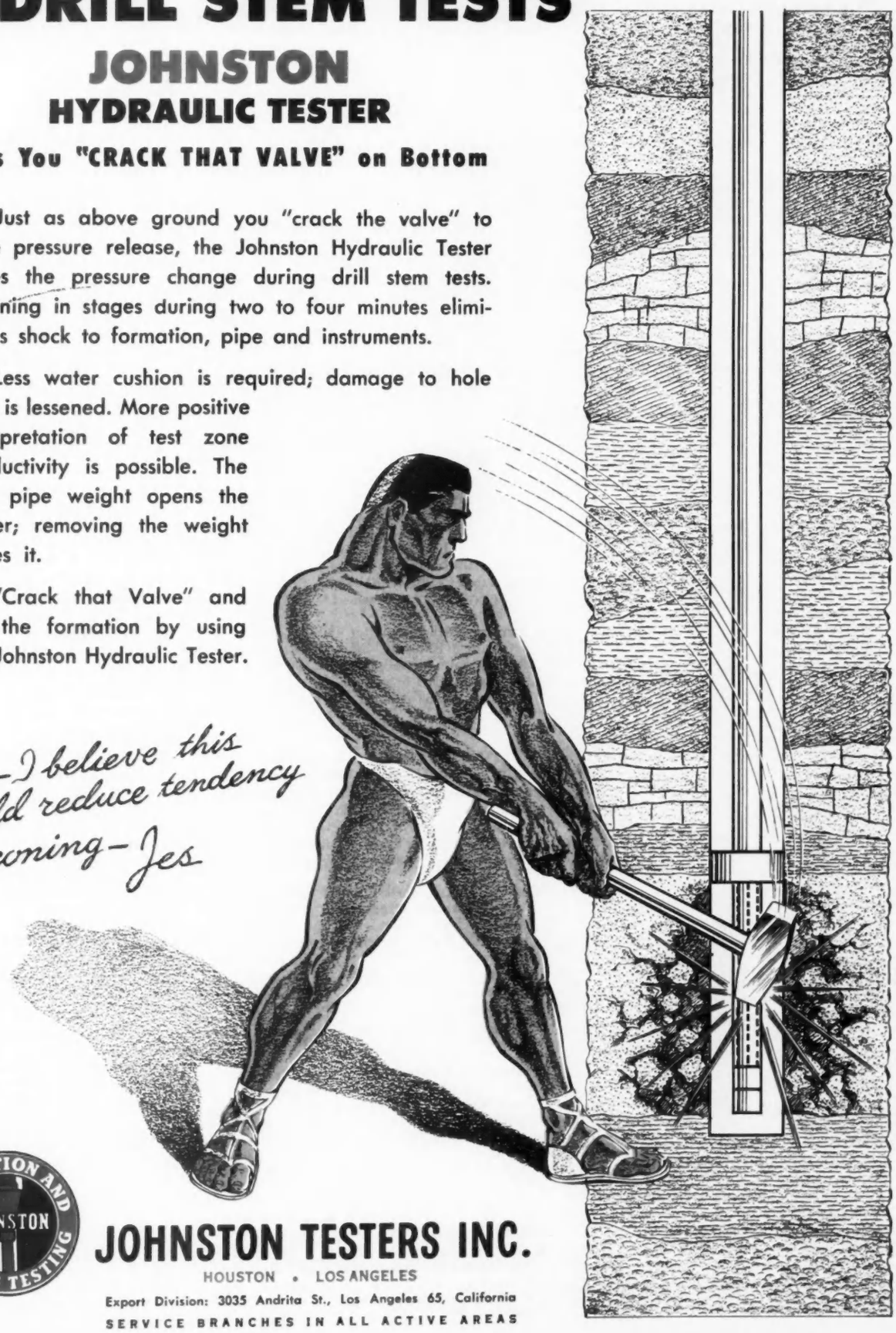

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KANSAS—OIL FIELD EXTENSION

Barton County, Great Bend field. Honaker Drilling Co.'s Haberman 1, NW NE NE 28-19s-13w, 1 mile south extension, pumped 235 barrels from Arbuckle lime, Ordovician 3442-46 feet, TD 3490.

KANSAS—NEW GAS FIELDS

Cowley County. Texas Co.'s Wiebe 1, NE NW NW 28-31s-6e, flowed 3.2 million from Stal 2220-26 feet, TD 3001.

Pawnee County. Natural Gas & Oil & Sinclair's Hearn 1, SE SW NE 35-23s-15w, flowed 4.0 million from Lansing lime, Pennsylvanian 3833-37 feet, TD 4157.

KANSAS—GAS FIELD EXTENSION

Meade County, McKinney field. Skelly Oil Co.'s Ediger 1, NW NW SE 11-33s-27w, 3-mile northwest extension, flowed 5.5 million from Chester sand, Mississippian 5686-91 and 5715-38 feet, TD 6106.

KENTUCKY—NEW OIL FIELDS

Daviess County. Henry E. Bruder et al's George M. Taylor 1, NW NE SE 12-Q-30, flowed 10 barrels from Tar Springs sand, Mississippian 824-838 feet, TD 838.

Muhlenberg County. J. C. Miller Oil-Ashland Oil Refining Co.'s Zeigler Mins 3, NW SE SW 18-J-26, pumped 8 barrels from Bethel lime, Mississippian 1855-65 feet, TD 2052.

NORTH LOUISIANA—NEW GAS PAY

Caddo County, Greenwood field. States Oil Co.'s Willie Wilbert 1, in 8-17n-15w, flowed 50 barrels distillate and 2.4 million from Cotton Valley "D" sand, Jurassic 8529-39 feet, 56.8-gravity, completed 11-1-53, TD 8722.

SOUTH LOUISIANA—NEW OIL FIELDS

Lafourche Parish, Coffee Bay field. Interstate Natural Gas Co., Inc.'s Grandison 1, in 11-19s-23e, flowed 243 barrels from 11,403-405 feet, 8/64-inch, 30.1-gravity, completed 11-10-53, TD 11,-862.

Plaquemines Parish, Breton Sound Block 20 field. Kerr McGee Oil Industries' State Lease 1998-AA-1, flowed 288 barrels from 6063-66 feet, 11/64-inch, 32-gravity, completed 11-18-53, TD 7000.

Rapides Parish. Union Producing Company's Eota Realty Company 8, in 23-5n-3e, pumped 60 barrels from Middle Wilcox sand, Eocene 5057-59 feet, 40-gravity, completed 11-2-53, TD 6015.

St. Landry Parish. Sohio Petroleum Co. & Gulf Refining Co.'s George H. Parker 1, in 72-4s-4e, flowed 168 barrels oil and 0.8 million from 10,142-147 feet, 8/64-inch, 49.6-gravity, completed 11-16-53, TD 12,320.

SOUTH LOUISIANA—NEW OIL PAYS

Cameron Parish, Grand Lake field. The Texas Co. & A. C. Glassell, Jr.'s Emily G. Comegys 6, in 18-13s-3w, flowed 120 barrels from 6128-34 feet, 8/64-inch, 32.1-gravity, completed 11-18-53, TD 6640.

Hackberry, East field. The Texas Co.'s State-East Hackberry 53, in 12s-9w, flowed 292 barrels from 10,927-941 feet, 10/64-inch, 32-gravity, completed 11-22-53, TD 11,167.

Lafourche Parish, Delta Farms, West field. John W. Mecom's A. C. Greene 6, in 2-17s-22e, flowed 334 barrels from 10,-573-576 feet, 10/64-inch, 32.1-gravity, completed 11-16-53, TD 11,405.

Plaquemines Parish, Main Pass Block 35 field. Shell Oil Company's State Lease 1961-21, Main Pass Block 35, flowed 261 barrels from 9748-52 and 9764-68 feet, ⅛-inch, 28.9-gravity, completed 11-11-53, TD 9874.

Main Pass Block 35 field. Shell Oil Company's State Lease 1961-23, Main Pass Block 35, flowed 263 barrels from 8522-26 feet, 9/64-inch, 28.2-gravity, completed 11-12-53, TD 8558.

St. Landry Parish, Savoy field. Stanolind Oil & Gas Co.'s Marcus Garcille 1, in 50-6s-1e, flowed 48 barrels from 8460-66 feet, 9/64-inch, 38.2-gravity, completed 11-4-53, TD 9515.

St. Martin Parish, Lake Mongoulois field. The Texas Co.'s Lake Mongoulois Unit 24, in 10-10s-9e, flowed 339 barrels from 6030-51 feet, 8/64-inch, 36-gravity, completed 11-14-53, TD 7300.

SOUTH LOUISIANA—NEW OIL PAYS

St. Mary Parish, Cote Blanche Island field. The Texas Company's State 340-Cote Blanche Island 22, in 15s-8e, flowed 522 barrels from 15,243-256 feet, 10/64-inch, 31.3-gravity, completed 11-8-53, TD 15,826.

SOUTH LOUISIANA—NEW DISTILLATE FIELDS

Beauregard Parish. Vincent & Welch's Long Bell Lumber Co. 1, in 21-5s-7w, flowed 100 barrels distillate and 1.0 million from 8989-9040 feet, 8/64-inch, 57.2-gravity, completed 11-15-53, TD 10,057.

St. Landry Parish. Sinclair Oil & Gas Co. & Atlantic Refining Co.'s Brewer-Nienstedt 1, in 21-4s-6e, flowed 274 barrels distillate and 1.6 million from 11,111-117 feet, 11/64-inch, 53.4-gravity, completed 11-14-53, TD 11,641.

SOUTH LOUISIANA—NEW DISTILLATE PAYS

Acadia Parish, Church Point field. Union Sulphur & Oil Co.'s Harmon B-1, in 69-7s-2e, flowed 116 barrels distillate and 1.6 million from 10,669-672 feet, 8/64-inch, 47.2-gravity, completed 11-7-53, TD 10,971.

Cameron Parish, Pecan Lake, South field. Pan American Production Company's Miami Corporation 10, in 4-15s-3w, flowed 20 barrels distillate and 4.4 million from 12,726-742 feet, ¼-inch, 44.5-gravity, completed 11-14-53, TD 13,-210.

SOUTH LOUISIANA—NEW GAS FIELDS

Beauregard Parish. Geological Services' J. A. Bel, et al 1, in 16-6s-9w, ungauged from 8552-63 feet, completed 11-27-53, TD 9223.

St. Mary Parish. Texas Crude Oil Co.'s L. Foster 1, in 2-14s-9e, ungauged from 10,729-731 feet, completed 11-25-53, TD 12,470.

SOUTH LOUISIANA—NEW GAS PAY

Acadia Parish, Crowley, North field. Humble Oil & Refining Co.'s N. C. Rowley Unit 4-1, in 21-8s-1e, ungauged from 4283-86 feet, completed 11-15-53, TD 6955.

MICHIGAN—NEW OIL FIELD

Ottawa County. James J. McGerry, Trustee's Homrich 1, NW SE NW 33-8n-13w, Wright Township, flowed 50 barrels from Traverse lime, Devonian 1919-21 feet, TD 1921.

MICHIGAN—OIL FIELD EXTENSION

Van Buren County, Lawton field. Ford Oil Co.'s Benjamin 1, NE NW SW 17-4s-13w, Porter Township, Northeast extension, flowed 6 barrels from Traverse lime, Devonian 1149-53 feet, TD 1153.

MISSISSIPPI—NEW OIL FIELD

Franklin County. Sunnyland Contracting Co.'s Lewis M. McGehee 1, C SE NW 48-5n-1e, flowed 80 barrels from 1st Wilcox sand, Eocene 4574-78 feet, 10/64-inch, 29.4-gravity, completed 11-7-53, TD 6871.

NEBRASKA—OIL FIELD EXTENSION

Cheyenne County, Cook field. Pubco Development Corp.'s Franzen 2, SW SE NW 25-15n-19w, ½-mile southeast extension, pumped 275 barrels from "D" sand, Upper Cretaceous 4308½-10½ feet, completed 11-29-53, TD 5322.

NEW MEXICO—NEW OIL FIELDS

Eddy County. Claude E. Aikman's Stanolind-State 1, in 36-19s-30e, pumped 81 barrels from Yates sand, Permian 2047-55 feet, 22-gravity, completed 10-16-53, TD 2055.

Sandoval County. Magnolia Petroleum Co.'s Hutchinson-Federal 1, C NW SW 14-19n-3w, pumped 79 barrels from Entrada lime, Jurassic 5210-15 feet, 33-gravity, completed 11-23-53, TD 9684.

NEW MEXICO—NEW OIL PAY

Lea County, Langlie Mattix field. Gulf Oil Corp.'s Lillie 2, in 23-24s-37e, pumped 557 barrels from Drinkard lime, Permian 6210-6320 feet, 40-gravity, completed 11-5-53, TD 8391.

NEW MEXICO—NEW GAS FIELDS

Eddy County. Harry Leonard's Leonard-Folk 1, in 17-17s-29e, flowed 0.4 million from 1916-50 feet, open, completed 11-4-53, TD 2463.

Rio Arriba County. El Paso Natural Gas Co.'s San Juan 27-5 Unit 5, NE SW NE 34-27n-5w, flowed 1.5 million from Mesaverde sand, Upper Cretaceous, completed 11-9-53, TD 5674.

Unnamed field. Phillips Petroleum Co.'s Indian 1-B, SE NW NE 21-28n-3w, flowed 2.5 million from Mesaverde sand, Upper Cretaceous, completed 2-1-53, TD 6264.

San Juan County. Phillips Petroleum Co.'s San Juan 32-7 Unit 5-8, NW SE NE 8-31n-7w, flowed 1.5 million from Mesaverde sand, Upper Cretaceous, completed 11-4-53, TD 5960.

NORTH DAKOTA—NEW GAS FIELD

Renville County. Leach & Kelsch's Oscar Brudvik 1, NW NW SW 21-161n-84w, flowed 0.1 million from 275-277 feet, completed 11-3-53, TD 303.

OHIO—NEW GAS PAY

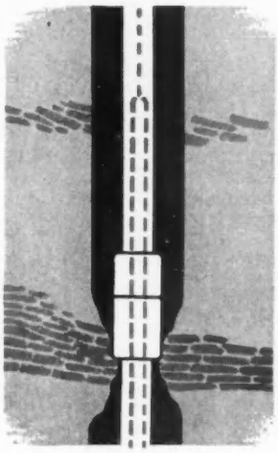
Noble County, Cambridge field. Great Lakes Carbon Corp.'s Herman Pabst 1, Section 15, Elk Township, flowed 0.2 million from Ohio shale, Devonian 2551-4810 feet, TD 5080.

OHIO—GAS FIELD EXTENSION

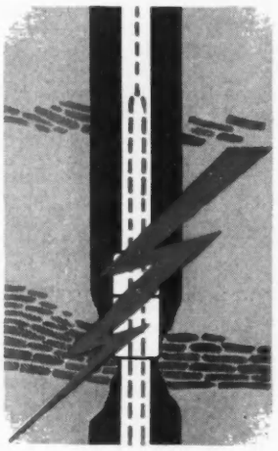
Lake County, Ashtabula field. Morton Salt Co.'s New York Central R. R. 1, Lot 24, Painesville Township, flowed 4.1 million from Austinburg sand, Devonian 1535-38 feet, TD 1538.

When you're stuck...

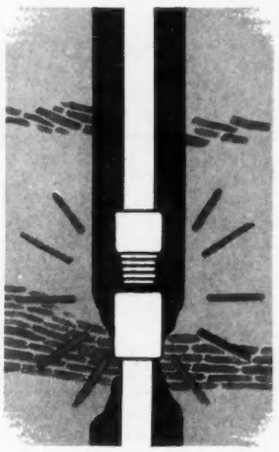
DIA-LOG's *unbeatable combination recovers drill pipe faster than any other method!*



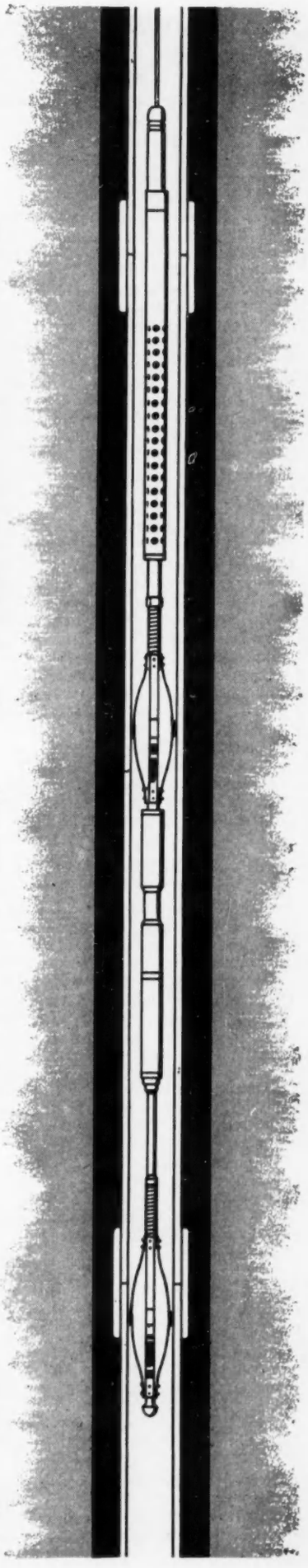
Free Point Indicator locates lowest depth where stretch and torque can be applied on the drill string.



The "String Shot" is lowered to the same depth on the same cable and detonated to loosen tool joint.



Back off recovers stuck drill pipe, drill collars, tubing or casing to permit further fishing operations.



THE DIA-LOG FREE POINT INDICATOR

This tool accurately determines the lowest depth where *both stretch and torque* can be applied to the drill string. It locates the exact point where stuck drill pipe, drill collars, tubing or casing can be freed. Movements as small as *one-thousandth of an inch* are recorded electronically on a surface indicating panel. Since reverse torque is used to back off, pipe to be recovered must be free in torque as well as stretch. *The Dia-Log Free Point Indicator gives you this correct depth in a matter of minutes!*

THE DIA-LOG STRING SHOT BACK-OFF

On the same electric conductor cable used for the Dia-Log Free Point Indicator, a "String Shot Back-Off" is run to the desired depth. Upon detonation, the "String Shot" delivers a sharp jar sufficient to start the unscrewing of the load-free joint. In thousands of successful runs, Dia-Log has recovered *millions* of feet of stuck pipe quickly and economically by employing this infallible combination. The "String Shot" also jars loose stuck tubing packers, frozen overshots, safety joints and stuck liners.

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BOX 800 — **WHITTIER, CALIFORNIA**

Ventura, California
Taft, California

OKLAHOMA—NEW OIL FIELDS

Cleveland County. Ashland Oil & Refining Co.'s C. W. Nance 1, SW SE NW 19-7n-1e, flowed 205 barrels from 2nd Wilcox sand, Ordovician 6989-7002 feet, 16/64-inch, TD 7790.

Coal County. Pipe Sales & Service Inc.'s McMillian 1, SW NE SW 10-1s-8e, pumped 2 barrels from Dolomite 1160-92 feet, 42-gravity, TD 1408.

Cotton County. Earl Rader's Buxton 1, SE SE NW 10-1s-10w, pumped 1 barrel oil and 35 barrels water from 2360-80 feet, 21-gravity, TD 2455.

Garfield County. Russell Cobb, Jr. & D. & L. Oil Co.'s Noteware 1, NE NW SE 32-24n-3w, pumped 25 barrels oil and 100 barrels water from 2077-99 feet, 40-gravity, TD 5467.

Grady County. Phillips Petroleum Co.'s Lack 1, C SW SE 35-5n-5w, flowed 75 barrels from Springer sand, Pennsylvanian 9430-40 feet, 16/64-inch, 43.7-gravity, TD 10,306.

Lincoln County. Barron Kidd's Sheldon 1, NE NW SW 8-13n-6e, pumped 4 barrels oil and 38 barrels water from 2nd Wilcox sand, Ordovician 4385-4407 feet, 13-gravity, TD 4407.

Logan County. Herzel Smith & Harper-Turner's J. E. Gaffney 1, NW SE SW 20-15n-2w, flowed 78 barrels from 2nd Wilcox sand, Ordovician 6198-6202 feet, 7/64-inch, TD 6210.

Noble County. Beach & Talbot's W. D. Greenshields 1, NW NW SW 3-22n-2e, pumped 72 barrels oil and 79 barrels water from Marsh sand, Ordovician 4495-98 feet, TD 4550.

Payne County. Falcon-Seaboard Drilling Co.'s Reynolds 1, SE SE SW 2-19n-6e, flowed 8 barrels oil and 3 barrels water from Lower Skinner sand, Pennsylvanian 2890-2904 feet, TD 2904.

OKLAHOMA—OIL FIELD EXTENSIONS

Carter County, Caddo, North field. Goldsmith & Perkins' Herman Smith 1, SW SW SE 15-3s-1e, flowed 32 barrels from Hunton lime, Devo-Silurian 5986-6024 feet, ½-inch, 40-gravity, TD 6065.

Creek County, Bristow field. Grimes & Neal's Bishop 2, NW NW NE 12-16n-9e, pumped 43 barrels oil and 45 barrels water from Red Fork sand, Pennsylvanian 2274-82 feet, TD 2320.

Tibbens field. J. A. Ligon's E. E. Mount 1, NE NW SW 6-14n-9e, pumped 140 barrels from Wilcox dolomite, Ordovician 3719-35 feet, TD 3743.

Oklahoma County. Calvert Drilling Co. et al's Remund 1, NW NW NE 24-14n-4w, flowed 51 barrels oil and 11 barrels water from Dolomite 6550-6610 feet, 43-gravity, TD 6780.

Stephens County. British American Oil Producing Co.'s Lee Wade 1, S½ N½ SE 19-1n-4w, flowed 200 barrels from Markham sand, Pennsylvanian 6100-60 feet, 18/64-inch, 37.5-gravity, TD 8257.

OKLAHOMA—NEW GAS FIELDS

Lincoln County. N. V. Duncan's Deatherage Estate 1, SW SW SW 13-14n-2e, flowed 2.9 million from Checkerboard sand, Pennsylvanian 3627-34 feet, TD 5262.

Pawnee County. Davon Oil & Gas Co.'s School Lands 1, SE SW SE 36-21n-5e, flowed 0.3 million from Red Fork sand, Pennsylvanian 3064-82 feet, ¼-inch, TD 3082.

OKLAHOMA—GAS FIELD EXTENSION

Okfuskee County, Weleetka, North field. George W. Blaylock & W. W. Dyer's Wright 1, NW NE SE 28-11n-11e, flowed 28.5 million from Dutcher sand, Pennsylvnaian 2762-2803 feet, TD 2910.

TENNESSEE—NEW OIL FIELD

Fentress County. Guy Williams' R. C. Pike-Gladis Williams 1, SE NW NW 12-A-55e, pumped 50 barrels from Pencil Cave lime, Devonian 1125-34 feet, 33.8-gravity, completed 9-25-53, TD 1134.

TEXAS DISTRICT 1—NEW OIL FIELDS

Atascosa County. Armstrong & Horn Drilling Co.'s T. M. Davies 1, L. Rivos Survey 63, pumped 91 barrels from 4970-5003 feet, completed 11-12-53, TD 5003.

Unnamed field. Drilling & Exploration Co., Inc.'s Wilkins Tex. Corp. 1, Maria Delores Diaz Survey 50, flowed 8 barrels from 3450-70 feet, 18/64-inch, 38.5-gravity, completed 11-28-53, TD 3470.

Unnamed field. Sutton Drilling Co.'s S. H. Nixon 1, John H. Gibson Survey 1609, flowed 23 barrels from Navarro sand, Upper Cretaceous 3670-91 feet, 10/64-inch, 47-gravity, completed 11-16-53, TD 3691.

Wilson County, Palmer field. Sutton Drilling Co. & L. L. Palmer's H. E. Mcdaniel 1, Jose B. Niestro Survey, pumped 38 barrels from 2810-18 feet, 25-gravity, completed 11-10-53, TD 2860.

TEXAS DISTRICT 1—NEW GAS FIELD

Frio County. J. C. Wynne's Nellie M. Williams et al 1, Matthew C. Pallon Survey, flowed 1.1 million from 3010-67 feet, completed 11-20-53, TD 3067.

TEXAS DISTRICT 2—NEW DISTILLATE FIELD

Jackson County. Aluminum Co. of America (Mining Division) & Crown Central Petroleum's F. E. Appling 1, Samuel Lyons Survey, pumped ungauged distillate and 18.0 million from 8498-8508 feet, completed 11-5-53, TD 9772.

TEXAS DISTRICT 2—NEW GAS FIELD

De Witt County. Francis J. Hynes' W. R. Egg 1, John F. Pettus Survey, ungauged from 8097-8108 feet, completed 10-19-53, TD 8357.

TEXAS DISTRICT 3—NEW OIL FIELDS

Fayette County. Hamman O&R Co. & States Marine Corp.'s Mattie Derry et al 1, James Seaton Survey, pumped 26 barrels from Upper Wilcox sand, Eocene 1875-88 feet, 20.4-gravity, completed 10-22-53, TD 1886.

Harris County. J. M. Huber Corp. & Columbian Fuel Co.'s Milton Keng 1, WC RR Survey, Section 25, flowed 155 barrels from 6701-03 feet, 3/16-inch, 38-gravity, completed 11-1-53, TD 7613.

TEXAS DISTRICT 3—NEW OIL PAYS

Galveston County, Dickinson field. John W. Mecom's San Leon Farms et al Unit 1, A. Edwards Survey, Block 98, flowed 185 barrels from 8090-8104 feet, 10/64-inch, 34.2-gravity, completed 11-28-53, TD 8915.

Jefferson County, Spindletop field. The Texas Co.'s Silver Dime Fee 1, J. A. Veatch League, Block 22, Gladys City Oil & Gas Manufacturing Co. Subdivision, flowed 80 barrels from Marginulina sand, Oligocene 4041-50 feet, 10/64-inch, 26.9-gravity, completed 11-15-53, TD 4464.

TEXAS DISTRICT 3—NEW DISTILLATE FIELD

Brazoria County, Bonney Townsite field. C. W. Vick's A. N. Nelson 1, W. D. C. Hall Survey, Block 25, flowed 135 barrels distillate and 8.2 million from 7284-86 feet, 59.4-gravity, completed 10-6-53, TD 9874.

TEXAS DISTRICT 3—NEW DISTILLATE PAY

Orange County, Port Neches, North field. Kirby Petroleum Co.'s East Beaumont Townsite Co. 1, Stephenson Survey, flowed 80 barrels distillate and 4.0 million from Frio sand, Oligocene 8753-60 feet, 56-gravity, completed 11-21-53, TD 9215.

TEXAS DISTRICT 3—NEW GAS FIELD

Liberty County. Floyd L. Karsten's H. A. Weeren 1, F. Gibenrath Survey, ungauged from Kirby sand, Eocene 8678-84 feet, completed 10-22-53, TD 9651.

TEXAS DISTRICT 3—NEW GAS PAY

Matagorda County, Markham, North & Bay City, North field. The Ohio Oil Co.'s E. L. McDonald A/C 2-16, Jacob Betts League, flowed 4.6 million from 8843-52 feet, 12/64-inch, completed 11-15-53, TD 11,680.

TEXAS DISTRICT 4—NEW OIL FIELDS

Nueces County, Clara Driscoll, Southeast field. Southern Minerals Corp. & Magnolia Petroleum Co.'s H. A. Johnson 1, George H. Paul Subdivision of Driscoll Ranch, Section 125, flowed 132 barrels from 5398-5408 feet, 9/64-inch, 41.9-gravity, completed 11-23-53, TD 7915.

San Patricio County, "Enos Cooper" field. Stanolind O&G Company's Letitia L. McCampbell 1, Enos Cooper Survey, flowed 165 barrels from 7785-90 feet, 5/64-inch, 41.8-gravity, completed 11-9-53, TD 11,336.

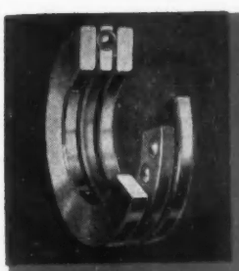
TEXAS DISTRICT 4—NEW OIL PAYS

Jim Wells County, Reynolds, North field. Inca Drilling Company's S. E. Miller 1, Benito Lopez de Jaen Survey, San Antonio de Agua Dulce Grant, Section 14, Reese & Dunn Subdivision, flowed 100 barrels from Frio sand, Oligocene 4787-91 feet, 10/64-inch, 30.3-gravity, completed 11-9-53, TD 5885.

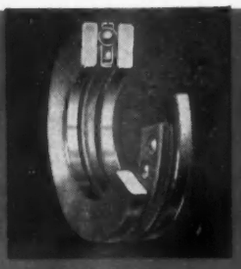
Tijerina-Canales-Blucher field. La Gloria Corporation's C. H. F. Blucher 31, Mrs. L. Best Survey 362-A, flowed 141 barrels from Antonio sand, Oligocene 6809-24 feet, 8/64-inch, 35-gravity, completed 11-5-53, TD 8010.

San Patricio County, Midway field. Forrest Oil Corp.'s Joe Floerke 1, George H. Paul Subdivision of the Coleman-Fulton Pasture Lands, Section 83, flowed 55 barrels from Patrick sand, Oligocene 6026-31 feet, 3/16-inch, 42.6-gravity, completed 11-5-53, TD 6115.

Taft, South field. Phillips Petroleum Company's Nellie A-1, Section 55, George H. Paul Subdivision of Coleman



B SERIES • Light duty, one direction ball thrust bearing. Flat seat. Flat races. Bronze ball retainer . . . 38 sizes ½" to 3½" I.D.



C SERIES • Light duty, one direction ball thrust bearing. Flat seat. Flat races. Pressed steel retainer . . . 16 sizes ½" to 1¾" I.D.

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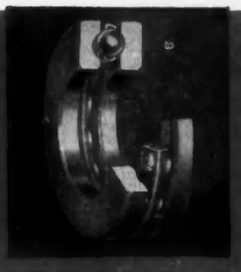
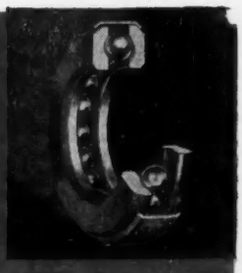


Q SERIES • Medium duty ball thrust bearing. Grooved races. Pressed steel or bronze (large sizes) retainer . . . 76 sizes ½" to 7½" I.D.



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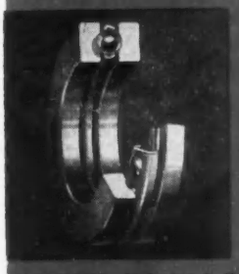
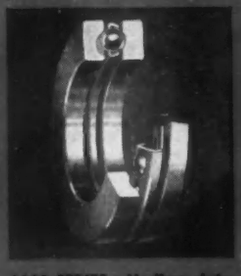
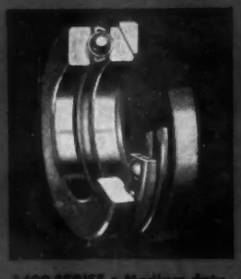


1000 SERIES • Light duty ball thrust bearing. Flat seat. Grooved races. Pressed steel retainer. Metric standard . . . 36 sizes 10 to 125 mm. I.D.



1100 SERIES • Medium duty ball thrust bearing. Grooved races. Pressed steel or bronze (large sizes) retainer . . . 23 metric sizes 10 to 140 mm. I.D.



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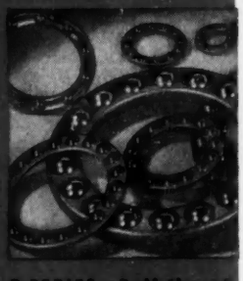

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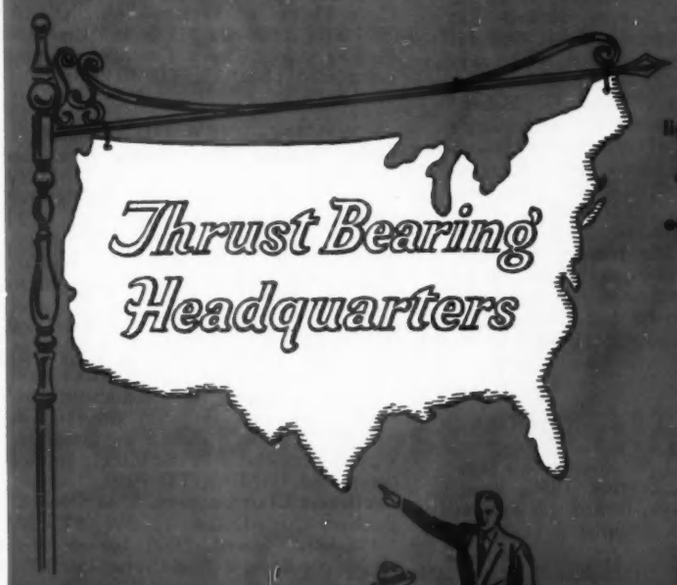

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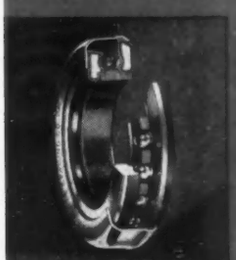

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Fulton Pasture Lands, flowed 152 barrels from Hall sand, Oligocene 6765-73 feet, 5.32-inch, 30.6-gravity, completed 11-14-53, TD 8000.

White Point, East field. Republic Natural Gas Co.'s D. C. Rachal et al 55, M. M. Flores Survey, flowed 215 barrels from Frio (Rachal) sand, Oligocene 8294-8504 feet, 9/64-inch, 35.9-gravity, completed 11-2-53, TD 9505.

Starr County, El Benadito field. Kirby Petroleum Co. & W. H. Holland's John Brannan 3-B, El Benadito Grant, Share 3, Block 18, Subdivision B, flowed 37 barrels from "B" sand 5026-34 feet, ¼-inch, 46.5-gravity, completed 10-22-53, TD 6003.

El Benadito field. Kirby Petroleum Co. & W. H. Holland's John Brannan 4-B, El Benadito Grant, Share 3, Subdivision B, Block 18, flowed 57 barrels from "D" sand 5068-70 feet, ¼-inch, 48.3-gravity, completed 11-15-53, TD 6002.

San Ramon field. C. G. Glasscock's H. P. Guerra 2-A, Las Cuevitas Grant, Share H-14B, pumped 11 barrels from 2048-54 feet, 24.2-gravity, completed 10-25-53, TD 2098.

Theljohn field. Earl A. Thompson & A. L. Herscamp's Ida Davis, Estate 1-C, Share 78, Block 15, Porcion 81, pumped 14 barrels 1398-1402, feet, 22-gravity, completed 11-23-53, TD 1493.

TEXAS DISTRICT 4—NEW DISTILLATE FIELDS

Hidalgo County, Alamo area. Stanolind O&G Company's T. T. Sanders Jr. 1, A. Wayne Wood Subdivision 1, Juan Jose Trevino & Lino Cavazos Grants, Lot 1, ungauged from 5536-42 feet, completed 11-1-53, TD 8103.

Kenedy County. Humble O&R Company's Clark & Sain 1, Santa Quiteria Grant, flowed 35 barrels distillate and 1.4 million from Frio sand, Oligocene 9976-92 feet, ¼-inch, 55.9-gravity, completed 11-5-53, TD 12,010.

Kleberg County. The Texas Company's State Tract 82-1, Cayo Del Grullo Bayou Tract 82, flowed 45 barrels distillate and 3.1 million from 11,430-446 feet, ¼-inch, 48.7-gravity, completed 11-10-53, TD 13,036.

Willacy County. The Texas Co.'s C. M. Corbett 1, Vicente de Hinojosa "Las Mestenas Pititas Y La Abra" Grant, La Jara Plantation Subdivision, Lot 8, Block 15, flowed 201 barrels distillate and 3.0 million from 9766-76 feet, 12/64-inch, 49.7-gravity, completed 11-4-53, TD 10,518.

TEXAS DISTRICT 4—NEW GAS FIELD

Duval County, "Selised Creek" field. The Texas Co.'s DCRC "A" NCT-12-1, GB&CNG RR Survey 61, flowed 1.7 million from Frio sand, Oligocene 1193-1205 feet, open, completed 11-15-53, TD 2410.

TEXAS DISTRICT 5—NEW OIL FIELD

Henderson County. Delta Drilling Co.'s A. S. Foster 1, Jose S. Cordova Survey, flowed 347 barrels from Bacon lime 7510-20 feet, ¼-inch, 44-gravity, completed 11-21-53, TD 8483.

TEXAS DISTRICT 6—NEW OIL FIELDS

Anderson County. Dunagan & Matise's Oran Thompson 1, Robert Erwin Survey, pumped 2 barrels from Wilcox sand, Eocene 470-525 feet, completed 11-12-53, TD 525.

Unnamed field. Otis Dunagan & Mike Matise's J. M. Delaney 1, Phillip Martin Survey, pumped 2 barrels from Wilcox sand, Eocene 474-511 feet, completed 11-12-53, TD 522.

Smith County. L. A. Grelling & American Liberty Oil Co.'s Louella Forks et al 1, Ben Lafferty Survey, pumped 69 barrels from Woodbine sand, Upper Cretaceous 4008-10 feet, 41.5-gravity, TD 4521.

TEXAS DISTRICT 6—NEW OIL PAY

Camp County. William D. McBee et al's H. G. Hatley B-1, Samuel Sexton Survey, pumped 297 barrels from Sub-Clarksville sand, Upper Cretaceous 3857-67 and 3872-78 feet, completed 11-9-53, TD 3950.

TEXAS DISTRICT 6—DISTILLATE FIELD EXTENSION

Panola County, Carthage field. McAlester Fuel Company's J. M. Shivers A-1, Wesley Goodwin Survey, flowed 58 barrels distillate and 2.1 million from Pettit lime, Lower Cretaceous 6768-74 feet, completed 11-5-53, TD 6908.

TEXAS DISTRICT 7-C—NEW OIL FIELDS

Reagan County. Big Lake Oil Company's University 1-11, Section 11, Block 2, University Lands Survey, flowed 232 barrels from Ellenburger lime, Ordovician 8890-8940 feet, ¼-inch, 42.1-gravity, completed 10-30-53, TD 8961.

Tom Green County, "Floyd G. Miller" field. Republic Natural Gas Company's Hair 1, Section 1, HT&B Survey, flowed 353 barrels from Cisco sand, Pennsylvanian 3300-10 feet, ¼-inch, 40-gravity, completed 11-10-53, TD 6200.

Unnamed field. Stanolind Oil & Gas Company's J. Willis Johnson, Jr. B-1, C. M. Dunn Survey 546, flowed 69 barrels from Canyon sand, Pennsylvanian 4640-54 and 4664-68 feet, 20/64-inch, 47.3-gravity, completed 11-21-53, TD 5782.

TEXAS DISTRICT 7-C—NEW GAS FIELD

McCulloch County. J. W. Alsobrook's Mrs. J. K. Shelton 1, Section 1098, Brennard Huperz Survey, flowed 4.0 million from 1305-10 feet, completed 11-25-53, TD 2290.

TEXAS DISTRICT 8—NEW OIL FIELDS

Andrews County. The Texas Company's Texas-Mabee 1, Section 32, Block 39, T-3-N, G&MMB&A Survey, pumped 72 barrels oil and 72 barrels water from Fusselman lime, Silurian 12,862-866 feet, 44.6-gravity, completed 11-11-53, TD 13,410.

Lamb County. The Texas Co.'s Union Compress & Warehouse Company 1-98, Lab. 12, League 664, State Capitol Lands Survey, pumped 121 barrels from San Andres lime, Permian 3952-84 and 4000-20 feet, 28.4-gravity, completed 11-17-53, TD 9842.

Sterling County. Clayton Smith's Lee Hunt 1, Section 2, Block T, T&P Survey, pumped 4 barrels from San Andres lime, Permian 1403-09, 1413-16 and 1518-22 feet, 2-inch, 33-gravity, completed 10-31-53, TD 1987.

Ward County. Bradford Drilling Company's E. R. McDaniels 1, Section 6, Block 5, H&TC Survey, pumped 14 barrels from Yates sand, Permian 2564-76 feet, 35-gravity, completed 11-10-53, TD 2576.

TEXAS DISTRICT 8—NEW OIL PAY

Dawson County, Spraberry, West field. Seaboard Oil Company of Delaware's Pettaway 2, Section 40, Block 34, T-5-N, T&P Survey, flowed 250 barrels from Spraberry sand, Permian 6655-6992 feet, 16/64-inch, 41-gravity, completed 11-24-53, TD 8195.

TEXAS DISTRICT 8—OIL FIELD EXTENSIONS

Ector County, Penwell field. Phillips Petroleum Company's Millard C-2, Section 17, Block B-15, PSL Survey, ¾-mile north extension, flowed 77 barrels from Wichita Albany lime, Permian 6540-95 and 6625-80 feet, 21/64-inch, 44.2-gravity, completed 10-13-53, TD 6730.

Sterling County, Durham field. Earle M. Craig, Jr.'s E. F. McEntyre 1, Section 3, Block T, T&P Survey, 1-mile northwest extension, pumped 19 barrels from San Andres lime, Permian 1452-56 and 1467-70 feet, 32.8-gravity, completed 11-6-53, TD 1477.

UTAH—NEW GAS FIELD

Emery County. Three States Natural Gas Co.'s Helen E. Walton 3-A, NE SW 30-14s-7e, flowed 112.0 million from Ferron sand, Upper Cretaceous, open, completed 11-20-53, TD 4049.

WYOMING—NEW OIL FIELDS

Johnson County, West Sussex area. Earl Mallette's Government 1, N/2 SE SW 33-43n-80w, pumped 150 barrels from Shannon sand, Upper Cretaceous 1734-64 feet, completed 7-18-53, TD 1803.

Unnamed field. Continental Oil Co.'s Unit 5, SE NE SE 8-41n-81w, pumped 30 barrels from Lakota sand, Lower Cretaceous 199-280 feet, completed 8-15-53, TD 975.

Weston County, Black Thunder area. Northern Drilling & Production Co.'s Government 1, NW NW 12-41n-67w, flowed 152 barrels from Newcastle lime, Upper Cretaceous 7846-60 feet, ½-inch, completed 11-13-53, TD 7930.

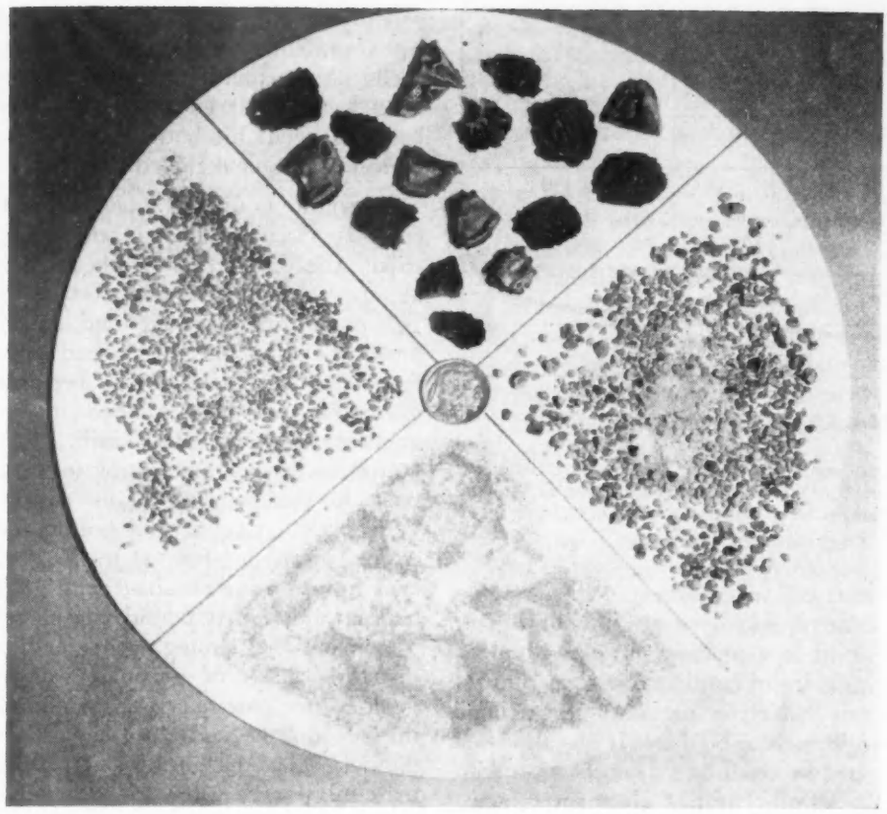
Southwest Clareton area. Voss Oil Co.'s Zachary-Gov't-Dixon 1, SW SW SW 1-41n-66w, flowed 1050 barrels from Newcastle lime, Upper Cretaceous 7034-46 feet, completed 10-21-53, TD 7300.

Unnamed field. C. G. Glasscock's Allie Dixon 1, NE SE NW 11-41n-66w, flowed 960 barrels from Newcastle lime, Upper Cretaceous 7154-7292 feet, open, completed 11-12-53, TD 7292.

Unnamed field. C. G. Glasscock's A. W. Dixon 1, NE SE NW 14-41n-66w, 1-mile south extension, flowed 760 barrels from Newcastle lime, Upper Cretaceous 7060-7160 feet, completed 11-6-53, TD 7179.

Unnamed field. Glasscock Drilling Co.'s A. W. Dixon 3, NE NW SW 14-41n-66w, ½-mile southwest extension, flowed 1008 barrels from Newcastle lime, Upper Cretaceous 7077-7201 feet, completed 11-18-53, TD 7201.

Unnamed field. Rapid Oil Co. Inc.'s Government 1, NW NW 19-42n-65w, flowed 50 barrels from Newcastle lime, Upper Cretaceous 6784-6804 feet, completed 10-16-53, TD 6925.



GRADED GRANULAR WALNUT SHELLS used as a bridging agent to combat lost circulation. Segmented photograph shows, clockwise, black walnut shell pieces; minus 4 plus 100 mesh; minus 40 plus 100 mesh; minus 10 plus 40 mesh.

Ground Walnut Shells Used To Combat Lost Circulation

• They provide effective sealing in fractures, vugular limestones and unconsolidated formations.

• Here's how the material is being used and some examples of successful application.

By ANTHONY GIBBON, WORLD OIL Staff

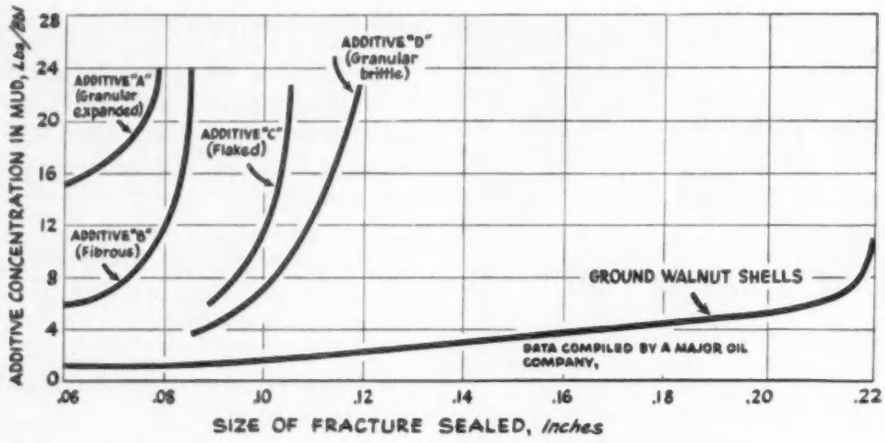
A GRANULAR MATERIAL made from black walnut shells has been used successfully to overcome lost circulation in drilling wells. In the Gulf Coast, in West Texas, California, and in other areas, operators report that, after regaining lost returns, it has frequently been possible to increase mud weights sufficiently to provide adequate safety margins for drilling into high pressure zones without further mud loss.

The bridging agent was developed in the Stanolind Oil and Gas Company laboratories in Tulsa, Okla. The following are some of the characteristics claimed:

- Will not break down under high differential well pressures, thus providing a stable bridge.
- High resistance to shock and chipping.
- The interlocking action of the granular particles reduces the danger of rupturing the seal once formed.
- Will not mat or ball up. It can be mixed through a hopper or pumped into pits and agitated with mud guns.
- Has no adverse chemical effects on flow properties, filtrate rate, viscosity, and cutting-carrying capacity of drilling fluids.

The material is graded to provide maximum sealing effectiveness in fractures, vugular limestones and unconsolidated formations as follows: 50 percent minus 4 plus 10 mesh; 25 percent minus 10 plus 40 mesh; 25 percent minus 40 plus 100 mesh. The coarse particles start the bridging of a fracture or vug; the medium sized particles plug the passages still existing in the coarse phase, and the fine particles start the filtration action of the mud and the formation of a filter cake. Granular walnut shells in all three particle sizes must be used at the same time for a successful job.

Five pounds of the sealing agent per barrel of mud is recommended as a preventative measure in areas where lost circulation may be expected. If mud loss continues, 10 to 20 pounds of the material per barrel of mud should be slugged into the circulating system. Slugs of 40 pounds per barrel have been used. High strength and particle size distribution combine to effect a strong seal. Sealable fractures or vugs are bridged very close to the well bore and will withstand high differential pressures with breakdown, thus minimizing the loss of mud to the formation. A comparison



GRAPH SHOWING bridging effect of ground walnut shells for various size fractures. The graph further shows the plugging action compared to other additives at varying concentrations.

of stability of seals of lost circulation materials (.106 inch slit) is shown in Table 1.

Inasmuch as the specific gravity of this bridging agent is approximately 1.2, some gel-strength is required to keep it in suspension in muds weighing less than 9.5 to 10 pounds per gallon. Although made from walnut shells, the bridging agent is non-abrasive and will not scour liners, but if used over an extended period it may, in time, imbed in pump rubbers. Certain types of pump valve rubbers are available for handling this and other lost circulation materials in high concentration without adverse effect.

Granular walnut shells have also proved effective in primary cementing and squeeze cementing operations. This is accounted for by high bridging characteristics which permit a more uniform and evenly distributed cement penetration and gradual pressure buildup. The material increases the angle of repose of cement because of its angularity and granularity. However, its use is not recommended alone as a sealing agent in a cavern when first penetrated although it has been successfully applied to develop a seal in a cavern that has been partially shut off with cement. When staging cement into a cavern the bridging agent in some cases has permitted the build-up of considerable squeeze pressure, which is necessary if extended drilling is to be done. It has also been used successfully in combination with diesel oil-bentonite plugs for combatting severe losses.

Two field examples in the successful application of granular walnut shells used to combat lost circulation are described:

Sharples Oil Corporation's TXL-C-4, Pegasus field (Pennsylvanian) Midland County, Texas. On May 7, 1953, the well was mudded up and complete circulation lost although the mud contained a fairly high concentration of other conventional lost circulation materials. Fifty sacks of granular walnut shells (30 pounds per barrel) were mixed in the suction pit and only 70 barrels of mud were displaced with the pipe on bottom when 100 percent returns were regained. Loss of mud occurred to a fractured shale section in the Spraberry zone at 6683 feet and the sealing agent was added at 6727 feet.

Drilling continued with no mud loss for four days when at 7145 feet, approximately 700 barrels of mud were lost to another highly fractured shale section. The system contained heavy concentration of conventional lost circulation materials but only 30 percent returns were obtained.

Fifty sacks of granular walnut shells were mixed in the suction in the order of 30 pounds per barrel and displaced with the bit on bottom. An additional five sacks each of wool, fiber, and cellophane flakes were added to the pit containing the granular walnut shells. Approximately 80 barrels of mud were displaced as soon as the bridging agent hit bottom and complete circulation regained.

A South Louisiana operator lost complete circulation when attempting to kill a salt water flow while drilling at approximately 11,600 feet with 16.8 pound high pH lime mud. Seven and five-eighths-inch casing had been set at approximately 11,250 feet and difficulties were encountered in regaining full circulation with 16.5 pound mud when attempting to wash back to the bottom of the casing. While circulating at the bottom of casing, approximately 90 to 95 percent returns were obtained with 16.5 pound mud. Thirty pounds per barrel of conventional sealing agents including three parts of granular walnut shells to one part fiber were added to the suction pit and displaced down the hole. The concentration of sealing material was adjusted to 10 pounds per barrel throughout the entire system during one complete circulation and 100 percent returns were regained. The mud weight was raised to 17 pounds and later to 17.5 pounds with no further loss of circulation to total depth, approximately 12,000 feet.

In the same area several cases of lost circulation were encountered which could not be satisfactorily overcome by any method short of setting casing. Out of seven jobs where granular walnut shells were used as the bridging agent six proved successful.

For temporary lost circulation in pay zones, coarse granular walnut shells mixed with a ground hydrocarbon resin soluble in oil but insoluble in water, are also being used. This new material is also applicable in workovers, in multiples fracturing and in selective acidizing. Because of the high degree of solubility of the resin in crude oil, recovery of the material is rapid and reduces cleanup time and swabbing. Some of the walnut shells are flushed out but those that remain, because of their coarse texture, do not reduce the permeability of the pay zone nor impede the normal flow of the oil into the well bore—**The End.**

TABLE 1

ADDITIVE	Concentration Lbs/Bbl	Maximum Differential Pressure Resisted By Seal p.s.i
Granular walnut shells (coarse)	3	3000 (pump limit)
Granular walnut shells (medium)	6	3000
Granular brittle	10	900
Flake	20	800
Fibrous	24	No seal
Granular expanded	24	No seal

ACKNOWLEDGMENT

Thanks are due Stanolind Oil and Gas Company, Tulsa, Okla., and David A. Garrick, president, Cherokee Laboratories, Inc., Tulsa, for information contained in this article and for the illustrations.

This article is the second revision of P. E. Chaney's original paper "A Review of Recent Advances in Drilling Mud Control," published in The Oil Weekly, Nov. 23, 1942, and A. P. I. Drilling and Production Practice, 1942, and subsequent revision "The Chemical Treatment of Drilling Fluids," published in Bulletin No. 96 of A. & M. College of Texas. It presents a general review of the colloidal chemistry of clays and shales as a background for the explanations of the various mud problems, and for the chemical treatments used in their correction.

While the original paper covered primarily the chemical treatment of low-pH muds and included the subjects of gas-cutting, heaving shale and lost circulation, this revision includes in addition more recent information regarding the chemical treating of lime-treated muds and oil emulsion muds. Inasmuch as such a large portion of all mud troubles is of chemical origin, it is essential that the field engineer has a working knowledge of the chemistry of colloidal clays. A careful study of the theoretical explanations of mud behavior is helpful to an understanding of the "why" of various mud-treatment methods, and assists in a determination of the proper procedure in handling unusual mud problems. For this reason, a discussion of colloidal clays is presented. The discussion is only a review of the literature, and, for a more complete study of this subject, the reader is referred to the list of references at the end of this article.

The Chemical Treatment Of Drilling Muds

- A large portion of all mud troubles encountered today in the presence of greater depths, higher pressures and temperatures is of chemical origin.
- It is essential that field engineers have a working knowledge of chemistry of colloidal clays.
- Here are the "whys" of chemical treatment.

By P. E. CHANEY and W. F. OXFORD, JR., Sun Oil Company, and **FRED CHISHOLM,** Magnet Cove Barium Corporation

THE CHEMICAL TREATMENT of drilling mud has made rapid advances during recent years. Greater depths, higher formation pressures, often the presence of high-pressure salt-water flows, heaving shale, and other conditions make mandatory the chemical treatment and control of drilling mud. Fully cognizant of the problem, the research engineers of the oil industry, of the universities, and of the commercial mud and chemical companies have sought and found explanations for many of the peculiarities of mud behavior.

Behavior of Clay Colloids

HYDRATION OF CLAYS. Colloidal materials may be divided into two general types, according to their action when suspended in water: The *suspensoids or hydrophobic* colloids have little affinity for water, and only form a stable suspension if the individual particle charge is sufficiently high to prevent coagulation. Such colloids do not swell in water. The *emulsoid or hydrophilic* colloids, on the other hand, have a strong affinity for water. Each emulsoid particle hydrates or sheaths itself in a protective film of water molecules, and a noticeable swelling of the colloid particles results.

Part 1

The bentonitic-clay colloids belong to this latter class, and most of the common mud troubles are caused by undesirable reactions involving these clay colloids. The bentonitic clays and shales are micaceous in structure; i.e., the individual clay particles are thin flat sheets, stacked in mica-like layers. On one of the flat surfaces of these individual leaflets are attached cations, such as Na^+, H^+, Ca^+, etc. The opposite surface, because of internal structure, is slightly negative with respect to the surface bearing these cations. Consequently, there is a weak electrostatic attraction between opposite faces of adjacent particles which serves to bind the plates together.

This bonding force is so weak that water molecules may enter and spread the plates apart. This process is responsible for the swelling of the clay, and the "planar water" so attached comprises a large part of the total water retained by the clay colloids.

This planar water is held in place by the weak residual electrostatic forces of the clay particles. These forces increase with increasing ionization of the clay particles; and it is, therefore, to be expected that the degree of swelling and the amount of water retained by the clays should vary according to the particular alkali or alkaline-earth metal present. The relative degrees of ionization of the more common clay salts decrease in

the order Li, Na, K, NH_4, Mg, Ca, Sr, Ba, H.[1]

Consequently, the degree of hydration and the relative stability of the clay decrease in the same order. This means that, for a given clay concentration, a clay containing sodium ions will swell more in fresh water than a clay in which the sodium is replaced by calcium or magnesium.

Clays are known by the predominating positive ion, as: sodium bentonite, calcium bentonite, etc. The best drilling clays are relatively pure sodium bentonites, inasmuch as these clays can retain larger quantities of water and are more stable and more readily dispersed than the alkali-earth clays, such as calcium bentonite.

Effect of pH Variation on Clay Colloids. The pH of a solution is defined technically as the logarithm of the reciprocal of its hydrogen ion concentration. In more simple terms, we may consider pure water, which has a pH of 7.0, as neutral. The addition of an alkali, such as sodium hydroxide, increases the pH, whereas the addition of an acid will reduce the pH. As the pH of a solution is reduced, the solution becomes progressively more acid; and, as the pH is increased, it becomes progressively more alkaline.

Variations in the pH, or hydrogen ion concentration, of a clay suspension produce corresponding changes in the physical properties of the suspension. The pH of a suspension of pure hydrogen bentonite, as obtained by electrodialysis, is in the range of 2.0 to 3.0. If sodium hydroxide be added slowly to this suspension, the pH will increase, and the hydrogen ions will be replaced by sodium ions up to a pH between 9.0 and 10.0. At this point the hydrogen ions are replaced completely by sodium, and the clay is now a sodium bentonite rather than a hydrogen bentonite.

Viscosity and gel rates vary with increasing pH in bentonite suspensions.[2] In the range of pH 4.5 to about 10.5 the viscosity at low rates of shear decreases with increasing pH, and a minimum in both viscosity and gel rate occurs in the range of pH 9.5 to 10.5. The ultimate gel strength of the suspension increases with increasing pH.[3] Thus, an increased pH tends to reduce the gel rate, but increases the gel strength, whereas a reduction in pH produces the opposite effect. Hence, to a certain extent, it is possible to adjust the relationship between gel rate and ultimate gel strength by pH control.

The mud pH has also an appreciable effect upon the rate of dispersion of shale colloids into the mud system.[4] Under the influence of fluid motion, the rate of dispersion of shales into the mud stream increases with increasing pH. Therefore, it is possible to increase the yield of natural mud from the shales drilled by maintaining the mud pH in the range of 9.5 to 10.5, rather than in the more usual range of 8.0 to 9.0. On the other hand, when heavily weighted muds are used and trouble is encountered from the rapid accumulation of colloidal material in the mud, it is advisable to reduce the pH to a value between 7.5 and 8.0 in order to retard the rate of shale dispersion.

Also, this treatment is advisable when bentonitic heaving shales are encountered, as a low pH reduces the tendency of these shales to swell and heave into the hole. However, low pH values may reduce the gel strength of muds below satisfactory limits, and this fact should be kept in mind whenever pH reduction is contemplated.

Viscosity Relationships of Clay Suspensions. There are at least three factors entering into the viscosity-concentration relationship for any given clay suspensions. These are: (1) the mutual repulsion due to particle charge; (2) the degree of hydration of the colloid particles; and (3) the mutual attraction due to unsatisfied or partly satisfied broken-bond valences.

1. Repulsive Forces Between Clay Particles.

The bentonitic clays may be considered as salts having a normal positive ion, such as sodium or calcium, but having an extremely large negative ion, consisting of the remainder of the clay particles. These salts are ionized to give a positive (sodium, calcium, etc.) ion, and a negative bentonite ion. The degree of ionization and, therefore, the effective negative charge on the bentonite particle depend on the positive ion with which the particle is combined.

Thus, a sodium bentonite will have a relatively higher negative particle charge than a calcium bentonite because of its higher degree of ionization. This negative particle charge causes a mutual repulsion between the particles, and tends to reduce particle friction and to prevent the formation of aggregates such as are formed when a drilling mud is flocculated by cement.

This effect alone would tend to yield lower viscosities in sodium-bentonite suspensions than in calcium-bentonite suspensions of the same concentration, but the expected reduction in viscosity due to greater repulsive forces in the sodium-bentonite suspension is more than balanced by the increases in viscosity due to a higher degree of hydration.

2. Hydration of Clay Particles.

The greater degree of ionization and the greater positive-ion hydration of sodium bentonites cause these clays to swell more and to absorb higher percentages of water than the corresponding calcium bentonites. The absorption of water by the clay particles increases their effective diameter, and at the same time inactivates a portion of the water in which the clay is suspended.

Both of these effects tend to increase the viscosity of the clay suspension, and are responsible for the fact that higher viscosities are obtained with a given clay concentration using sodium bentonites than with calcium bentonites.

The stability of colloidal suspensions is due to hydration and to the repulsive forces between the individual colloid particles. Any added impurity which tends to reduce the degree of hydration or the particle charge will reduce the stability of the suspension.

Thus, when a salt-water flow occurs, the high salt concentration in the drilling fluid serves to dehydrate the clay colloids and to repress their ionization. This reduces the forces stabilizing the suspension and causes flocculation and settling of the clay colloids.

3. Attractive Forces Between Clay Particles.

The third factor influencing the viscosity of clay suspensions is that of mutual attraction due to unsatisfied broken-bond valences. As previously explained, the individual clay particles are thin, flat sheets, which theoretically could have an unlimited width and length. However, in all natural clays these sheets are broken

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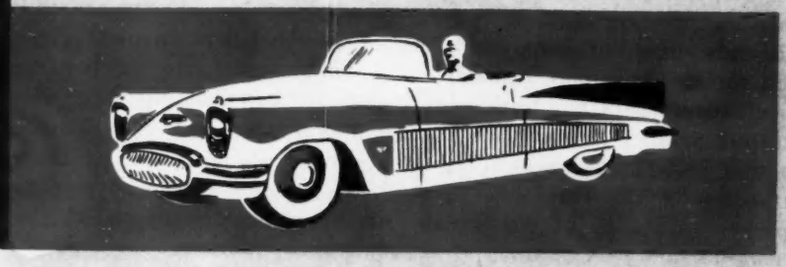

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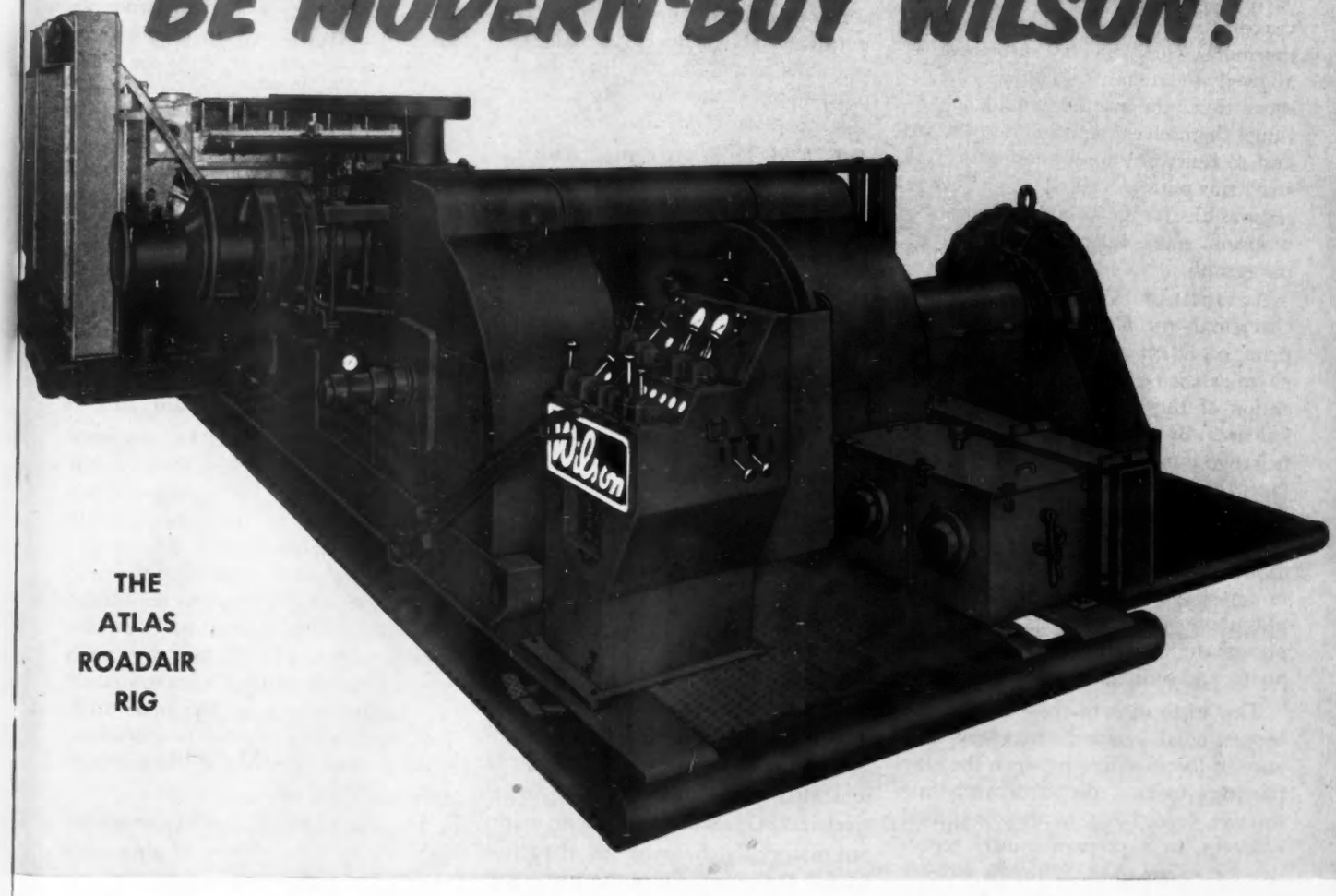

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into sections of very minute width and length.

At the surface of this fracture, there are frequently residual valence bonds which originally served to hold the larger sheets together, but which are now left chemically unsatisfied. These residual valences are satisfied in part by the adsorption or water at the broken surface, but there remains a relatively strong attractive force tending to pull another clay particle into a position such that it will form a continuation of the clay sheet and completely satisfy the residual valences of both clay particles.

This attractive force between the particles tends to increase the friction between them, and thus increases the viscosity of the clay suspension. Furthermore, when the clay suspension is allowed to remain quiescent for a short time, the particles tend to arrange themselves in a definite pattern and to resist any force tending to destroy this pattern. This latter effect is responsible for gelation, and will be discussed more fully in a subsequent paragraph.

Action of Viscosity-Reducing Chemical on Clay Colloids. The primary effect of viscosity-reducing chemicals is believed to be a neutralization of these residual broken-bond valences. By the absorption of certain negative ions at the broken-bond surface, these residual valences are satisfied almost completely. Among those negative ions preferentially adsorbed at the broken-bond surfaces are the tannates, gallates, and the complex phosphate ions, such as hexametaphosphate, sodium acid pyrophosphate, and sodium tetraphosphate.

The adsorption of these ions at the broken-bond surface alters the balance of forces acting between the clay particles from a preponderantly attractive force, due to these residual valences, to a preponderantly repulsive force, due to the normally weaker negative particle charge produced by ionization. As the forces acting between the particles are now preponderantly repulsive, the particles tend to avoid contact with one another. Particle friction and the tendency to form gel structures thus are reduced, with a consequent reduction in the viscosity of the clay suspension or drilling mud.

The clay solids in a first-class drilling mud are considered to be in a state of deflocculation. This is defined as the state of dispersion of a solid in a liquid, in which each solid particle remains geometrically independent and unassociated with adjacent particles. Conversely, flocculation is defined as the formation of clusters of particles separated by a relatively weak mechanical force or by a change at the interface between the particles and the suspended phase.

Flocculation and deflocculation are reversible under certain conditions depending upon base exchange capacity of the clay solids and the availability of exchangeable cations. The flocculation of drilling mud may be due to contamination by such things as sodium chloride and calcium sulfate encountered during the drilling operation. The deflocculation or dispersion of a drilling mud may be accomplished by the addition of one or a combination of the commonly used treating chemicals.

Thixotropic Properties of Clay Suspensions. The gelling qualities of a clay suspension are dependent upon the relative attractive and repulsive forces between the clay particles. If the attractive forces due to residual valency are strong and the repulsive forces due to ionization are weak, the mud will have a high gel rate and gel strength. On the other hand, if the repulsive forces are strong, while the attractive forces are weak, the mud will have a slow gel rate and a weak ultimate gel strength.

Any change which tends to alter the relationship between these attractive and repulsive forces will have a pronounced effect upon the gel characteristics of the mud. The addition of small quantities of soluble calcium salts or relatively larger quantities of sodium salts reduces the degree of ionization and, therefore, the negative charge on the clay particles, without materially changing the attractive forces. Consequently, the gel rate and gel strength of the mud will be increased.

On the other hand, the addition of a complex phosphate, for example, will neutralize the residual broken-bond valences without appreciably reducing the ionization of the clay. Hence the attractive forces are reduced in proportion to the repulsive forces, and a reduced gel rate, gel strength, and viscosity result. In some cases, it is difficult to control viscosity by chemical treatment without undesirable reduction in gel strength.

Thixotropy, or the ability to thicken on standing, in bentonitic muds can be traced to the action of the negative charges on the particles. These charges are assumed to be unevenly distributed over the surfaces of the clay particles so that there are relatively concentrated charges at some points and relatively less charges at others. Those parts having the greater charge repel each other strongly, and, when allowed to stand without disturbance, arrange themselves so that they are as far apart as possible.

This arrangement utimately brings the uncharged parts of the particles closer together. It is thus probable that long chains of particles are formed which naturally produce more internal friction and are more difficult to disturb than if they acted separately. These linkages are relatively weak so that stirring readily breaks them down into their individual units and the mud returns to its original viscosity. Chemical treatments may affect the speed and extent to which these chains of particles form by modifying both the size and character of the charges on the clay particles.

Lime-Treated Clays. Muds treated with slaked lime, $Ca(OH)_2$, are used extensively in deeper drilling in the Gulf Coast area. The composition and properties of lime-treated muds are to be discussed later. The theory of lime treatment of drilling fluids at first glance might seem to contradict some of the statements made in preceding paragraphs. In fact, for many years lime or cement contamination was regarded as a serious mud problem, and no engineer would have considered adding either of these materials to a good mud.

In spite of the apparent contradiction between the theory of phosphate muds and the behavior of lime-treated muds, the latter may be explained by an extension rather than a drastic revision of previous mud theory. As previously mentioned, the replacement of sodium by calcium on the clay particle reduces the degree of ionization of the clay and hence reduces the negative charge of the clay particle.

This effect is quite rapid, and is responsible for the extreme thicken-

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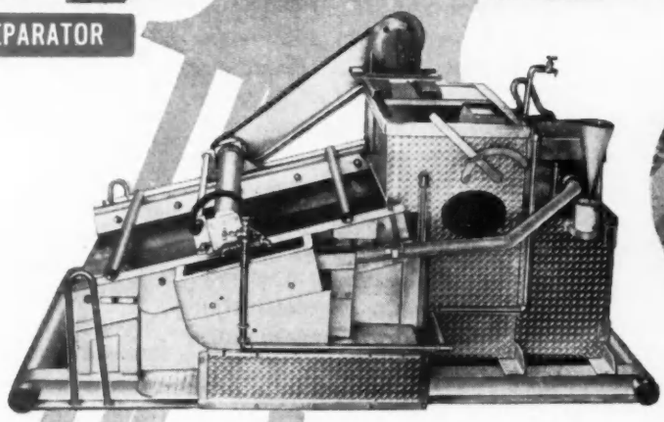

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ing of lime muds during the breakover. Since a considerable part of the repulsive force between the clay particles has been destroyed, the individual particles bond together, or flocculate, with a resultant increase in gel strength and apparent viscosity.

A second and slower effect of lime treatment is a shrinkage of the clay particles by dehydration. This effect in part accounts for the reduction in viscosity of the lime-treated mud after the breakover, and explains the ability of lime-treated muds to suspend a greater weight percentage of clay solids at a given viscosity than a corresponding sodium mud.

A third effect of lime treatment with muds previously treated with phosphates is for the lime to precipitate the phosphates. This loss of dispersing action contributes to extreme flocculation and thickening if the mud is converted to a lime-treated system.

The point of apparent conflict between previous mud theory and the behavior of lime-treated muds lies in the question of the effect of repulsive forces on the stability of clay colloids. It has been stated that the negative charge on sodium clays is greater than that on calcium clays. Therefore, the repulsive forces between sodium clay particles are correspondingly greater and the particles have less tendency to flocculate. This statement is correct, but it does not consider the effect of contaminants upon the system. The sodium clays have a considerable negative charge, which they *depend upon* to prevent flocculation.

Since this repulsive force is largely responsible for the deflocculation and stability of sodium clay suspensions, any contaminant which appreciably reduces this negative charge will cause flocculation of the clay. Such flocculation may be produced by contamination with soluble calcium salts, cement, salt or salt water, or even by excessive treatment with the phosphates ordinarily used as dispersants.

The important distinction between the lime-treated clays and the sodium clays is that, although the lime-treated clays have a lower repulsive force between particles and hence are in this sense less stable, they also depend less upon this repulsive force to maintain their stability and are therefore less sensitive to contaminants which tend to reduce particle charge.

Therefore, dispersing agents which will stabilize the lime-treated clay in spite of its lower particle charge should make a mud less sensitive to contamination with soluble salts which tend to further reduce particle charge. A suitable dispersant for lime-treated muds must be a material reasonably soluble in the presence of lime. This eliminates the complex phosphates, which form insoluble calcium salts. All dispersants for lime-treated muds now in commercial use are organic compounds, the more common ones being quebracho, calcium lignin sulfonate, or certain lignitic shales.

Daily Field Tests on Drilling Mud

The following tests are essential to any proper estimation of mud condition. They should be conducted daily, or more often in case of trouble. A suitable form or a place on the daily drilling report should be provided for reporting the results of these daily tests:

- Density or mud weight—Report pounds per gallon, pounds per cubic foot, or pounds per square inch per 100 feet of depth as required. Instrument should be calibrated once per day when weight is critical.
- Viscosity—The Marsh funnel is used for routine field measurement. Report viscosity in seconds.
- Fluid loss—Report cc. of filtrate at the end of thirty minutes. Measure and record cake thickness.
- pH—Measure with p-Hydrion paper or pH meter.
- Sand content—Report as percent by volume.
- Salt content—Report as p.p.m. chloride.

Other tests or factors which might enter into the evaluation of the mud system are as follows:

- Previous chemical treatment of the mud, such as additions of weight material, clay, chemicals, etc.
- P-alkalinity
- Lime content
- Initial and 10-minute gel strength
- Temperature
- Rate of circulation
- Amount of water added
- Drilling time and interruptions
- Remarks—In the daily report, under "remarks," record any mud properties such as high gel rate, gas bubbles, etc., which may be observed from the general appearance of the mud but which are not indicated directly by the foregoing test results. Also note any tight sections in the hole or other drilling difficulties which might possibly be corrected by suitable adjustments of mud properties.

The API has recommended standard methods of conducting the foregoing tests, and detailed procedures may be found in their publication entitled API Code 29: "Recommended Practice on Standard Field Procedure for Testing Drilling Fluids," third edition 1950.

During the drilling of a well the quality of the mud in circulation changes constantly, and proper testing methods as previously described are essential to continuous maintenance of good mud properties. Proper testing procedures allow diagnosis of many of the causes for mud deterioration. In the following pages we will discuss briefly the commonly used drilling muds, some of the causes for their deterioration, and related problems.

Commonly Used Drilling Muds

It is generally conceded that oil well drilling in the gulf coast and Southwest Texas areas, considered broadly, presents more unforeseen problems calling for specialized techniques of chemical treatment and drilling mud control than any other given area. For this reason, the different types of muds to be discussed in this paper will include those in common use in the Gulf Coast area:

- Phosphate muds
- Red muds
- Lime-treated muds
- Oil emulsion muds

PHOSPHATE MUDS. Phosphate muds are those in which the principal treating agent is one of the complex phosphates. The most commonly used phosphates in mud treating are sodium acid pyrophosphate (SAPP), with a pH of 4.8; sodium tetraphosphate, with a pH of 7.0 to 8.0; and tetrasodium pyrophosphate (TSPP), with a pH of 9.9. Any of these phosphates may be used alone or in combination with caustic and quebracho. Phosphate muds are normally used

where mud weights below 11.0 pounds per gallon are desired, where good mixing water is available, and where good mud-building formations are to be drilled.

Such muds have the advantages of simplicity of pilot testing, adaptability to standard treatment, and relatively low cost. The disadvantages of phosphate muds are susceptibility to contamination by sodium chloride, anhydrite, and cement, and the apparent chemical breakdown of the dispersant at temperatures above 180° F.

Only very small amounts of phosphates are required to control the viscosity of uncontaminated or slightly contaminated muds. The extent of treatment depends upon the formation being drilled and the weight desired.

Many wells make large quantities of mud as drilling progresses. Sometimes sufficient bentonite is present in the shales drilled to supply the entire gel fraction of the mud. Viscosity may be controlled by water, treating chemicals such as phosphates, or both. The treatment with phosphates may be supplemented by quebracho and sufficient caustic to maintain the pH at whatever level is required.

Red Muds. Red muds are muds in which the viscosity characteristics are controlled primarily by addition of caustic and quebracho. The filtrates from these muds will vary from a straw color to a deep red. Red muds are normally classified as low-pH or high-pH.

Low-pH red muds have a number of advantages over straight phosphate-treated muds. The muds are more flexible, maintain more constant properties, resist contamination, and are more effective at high temperatures than phosphate muds.

The usual pH range for low-pH red muds is from 8.5 to 9.5. In poor mud-making formations, additions of bentonite may be required to aid filtration properties. Frequently, one of the phosphates may be used to help reduce viscosity and gel characteristics.

High-pH red muds are operated within the approximate range of 10.5 to 11.5 pH. If starch is added for fluid loss control, the pH may be raised upward to 12, to insure the starch against bacterial decomposition. This mud has an even higher resistance to contamination than the low-pH red muds.

Lime-Treated Muds. In recent years it has been found that high-pH red muds can be made considerably more stable and more resistant to contamination by the simple addition of lime. Likewise, such muds are resistant to viscosity and gel strength build-up during the drilling of even the most colloidal shale.

Basically, lime-treated muds may be considered to consist of natural shale muds containing some added bentonite and possibly barytes to which an organic thinner, caustic, lime, and a fluid-loss-control agent have been added. Quebracho is the most frequently used organic thinning agent; however, other organics such as lignitic shale and calcium lignosulfonates have been successfully substituted for quebracho.

Any normal water-base mud may be converted to a lime-treated mud by the addition of the proper amounts of the required chemicals. Characteristically, the mud goes through what is generally considered a "breakover" where abnormally high viscosities are exhibited. The magnitude of the viscosity "hump" depends primarily upon the following variables:

- A base mud of high total solids and bentonite content, having received considerable phosphate treatment prior to conversion, will exhibit a high viscosity hump during breakover.
- A base mud of moderate total solids and bentonite content, having received limited previous chemical treatment, will exhibit a moderate viscosity hump.
- A base mud of low total solids and bentonite content, having received limited previous chemical treatment, will exhibit a minor viscosity hump.

In all three cases it is likely that after sufficient lime has been added the viscosity will fall below its initial value. Whenever a mud is to be converted to a lime-treated mud, it is vital that sufficient pilot tests be undertaken to determine the full story of possible viscosity alterations during the conversion.

The pilot tests should determine the actual amounts of caustic, organic dispersant, and lime required for the conversion and should also indicate the best order of addition of these materials in order to minimize the viscosity rise during the breakover. If the pilot tests show the conversion to be unusually difficult, then further tests must be carried out to determine the amount of water which should be added to the mud prior to conversion.

Increased knowledge of the behavior of lime-treated mud has made it one of the most valuable tools of the mud engineer. Such muds have a large tolerance for colloidal solids, are resistant to formation contaminants, and can be maintained at any desired weight between 10.5 and 20 pounds per gallon.

This type of mud is intended for deep drilling where abnormal pressures are expected or where contamination makes mud control troublesome. It is not suited for shallow drilling because the minimum cost of preparation is relatively high.

In the past, lime-treated muds have been difficult to control; but improved methods of testing have largely eliminated this objection. The method for determining the approximate lime content of mud proposed by P. E. Chaney has contributed much to simplify the control of lime-treated mud. Field experience has shown that stable lime-treated muds can be maintained by controlling the filtrate alkalinity, lime concentration, and organic-dispersant content within definite ranges of concentration.

The character of the shale in the formation being drilled influences the concentration of lime that is required to keep the mud stable, and the amount that is added to maintain that concentration. A typical lime-treated mud contains approximately 3 lbs./bbl. caustic, 2 lbs./bbl. quebracho, and 8 lbs./bbl. lime; however, in the case of lime-treated muds employing calcium lignosulfonate or lignite as dispersant, different concentrations of caustic and dispersant might be considered typical.

It has been observed through experience that a lime-treated mud must always carry a surplus of undissolved lime for increased mud stability. The filtration properties of lime-treated muds are normally controlled with gelatinized starch.

Oil Emulsion Muds. Oil emulsion

muds are relatively new to the industry; however, outstanding accomplishments are attributed to the presence of emulsified oil in drilling muds. The term "emulsion mud" is used to identify any water-base drilling fluid containing oil and an emulsifying agent.

Oil emulsion muds are not a type of mud in themselves, since oil may be emulsified into any of the ordinary water-base muds. The properties of the emulsion mud will be substantially those of the base mud from which it is made, but including the advantages produced by emulsified oil.

An emulsion is an intimate mixture of two immiscible liquids, one being dispersed in the other in the form of fine droplets. A mixture of oil and water may be emulsified by violent agitation; but, upon standing, the droplets will coalesce to form two separate layers unless an emulsifying agent is present to stabilize the emulsion. Examples of the various materials that serve as emulsifying agents in drilling fluids are:

- Soaps, such as salts of higher fatty acids.
- Lignitic compounds and lignosulfonates.
- Organic colloids, such as starch and carboxymethylcellulose.
- Powdered solids, such as bentonite, shale, and silica.

It has been suggested that the mechanism of the stabilization by the above classes requires one or a combination of the following effects at the interface between the oil and the water:

- Lowering of the interfacial tension.
- Setting up of an electrical charge.
- Formation of insoluble films.
- Adsorption of solid particles.

These four mechanisms are closely related to the four examples of emulsifying agents, as each mechanism has been given to explain the action of the materials in each class. It is probable, however, that each class is affected to varying degrees by a combination of several of the mechanisms.

When oil is added to a mud and is properly emulsified, it exists as small, stable droplets in that mud. The fluid phase of the original mud is still the continuous phase, and the emulsified oil does not alter appreciably the effect that contaminants would have on that type of mud without the oil. Neglecting the effect of the contaminant on the emulsifying agent, the corrective treatment to overcome contamination would be the same as originally used on the particular base mud before adding the oil.

The addition of oil will not make a good mud of a poor mud; however, the addition of oil will make a better mud of a good mud. With an emulsion mud many beneficial results may be expected, such as increased bit life, increased drilling rate, and improved hole conditions. Emulsion muds give better bearing lubrication than mud without oil. Torque is sometimes decreased as much as 50 percent.

Pump pressures are lower, and, because of less balling tendency, drill collars and tool joints remain clean. Increased rates of penetration result from clean tools and increased rotating time due to longer bit life. Caliper logs show less hole enlargement with emulsion muds. —**End Part 1.**

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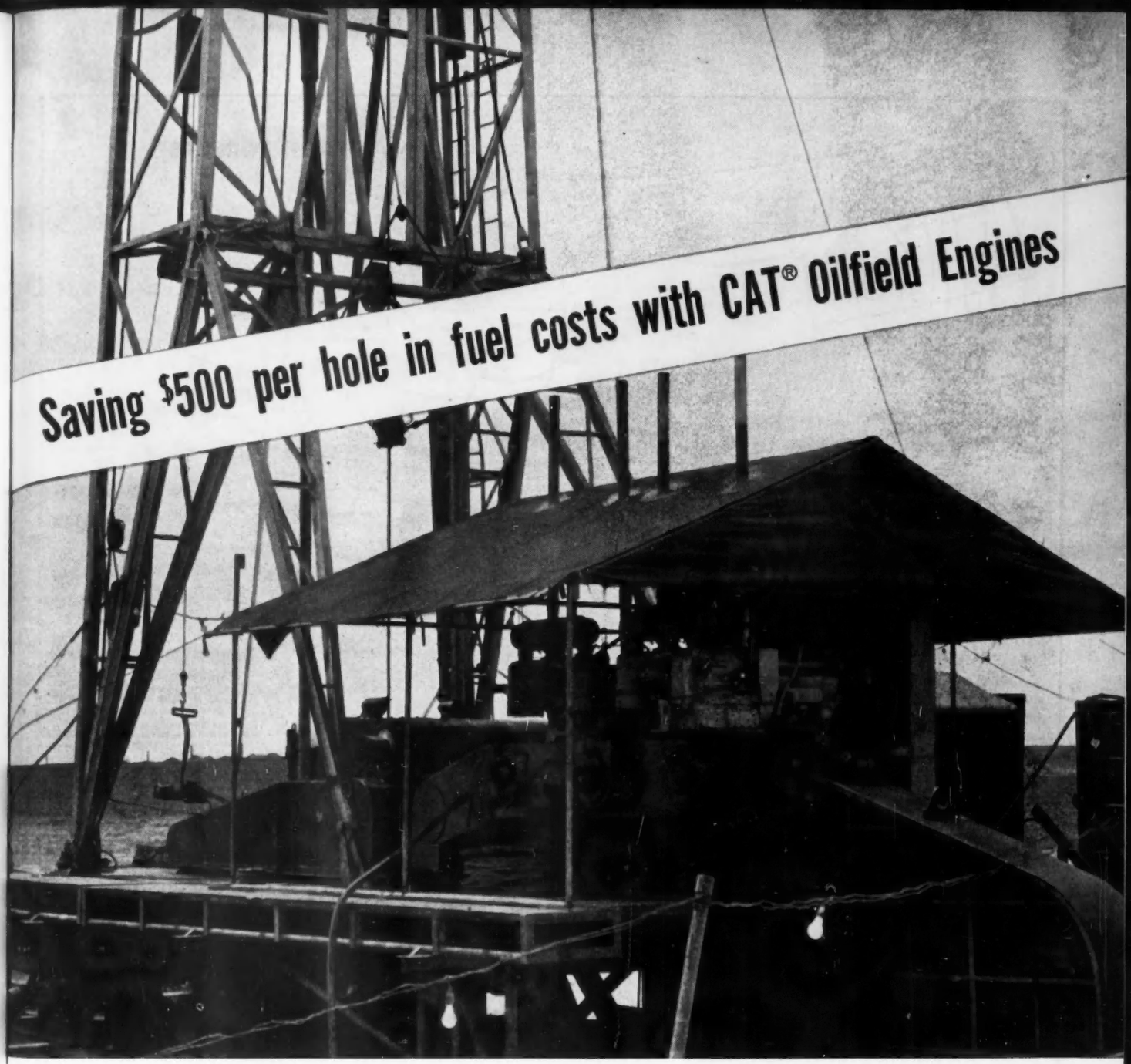
It's Easy to Get Hurt!

The Accident: Crew was going into the hole. Only one man was setting slips. As the elevators came within reach, the crewman attempted to slide slips into rotary bushing around the pipe. Slips were fouled between elevators and rotary, causing the slips to be jerked back. The handle struck crewman on the knee, causing a lost-time injury.

Recommendation: More than one man should be used to set the slips. It is suggested that one man be in a squatting position holding the two handles while another in the rear of the slips holds the other handle. As the elevators come down to about 6 or 8 feet, the driller should slow the drawworks. When at the desired height, the two crewmen should squeeze the slips around the pipe while the driller lowers the string. Excessive speed by the driller was one reason this accident happened.



With profit margins growing thinner, it's increasingly important to find equipment that will give you a better job at less cost. That's why Sterling Drilling Co., Sterling, Kan., recently installed two Caterpillar D375 Oilfield Engines to drive the Unit Rig drawworks and Gardner-Denver mud pump on one of its rigs.

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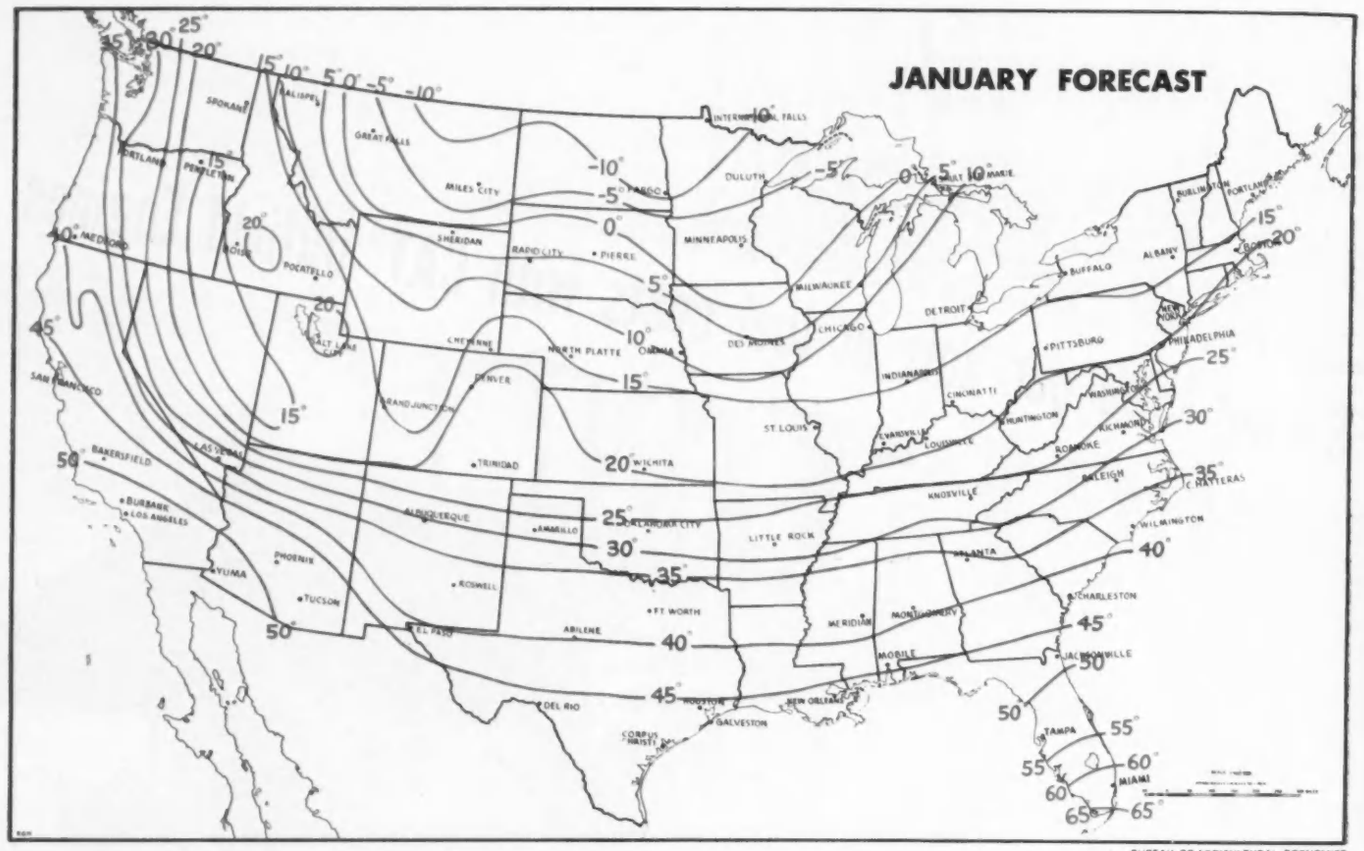

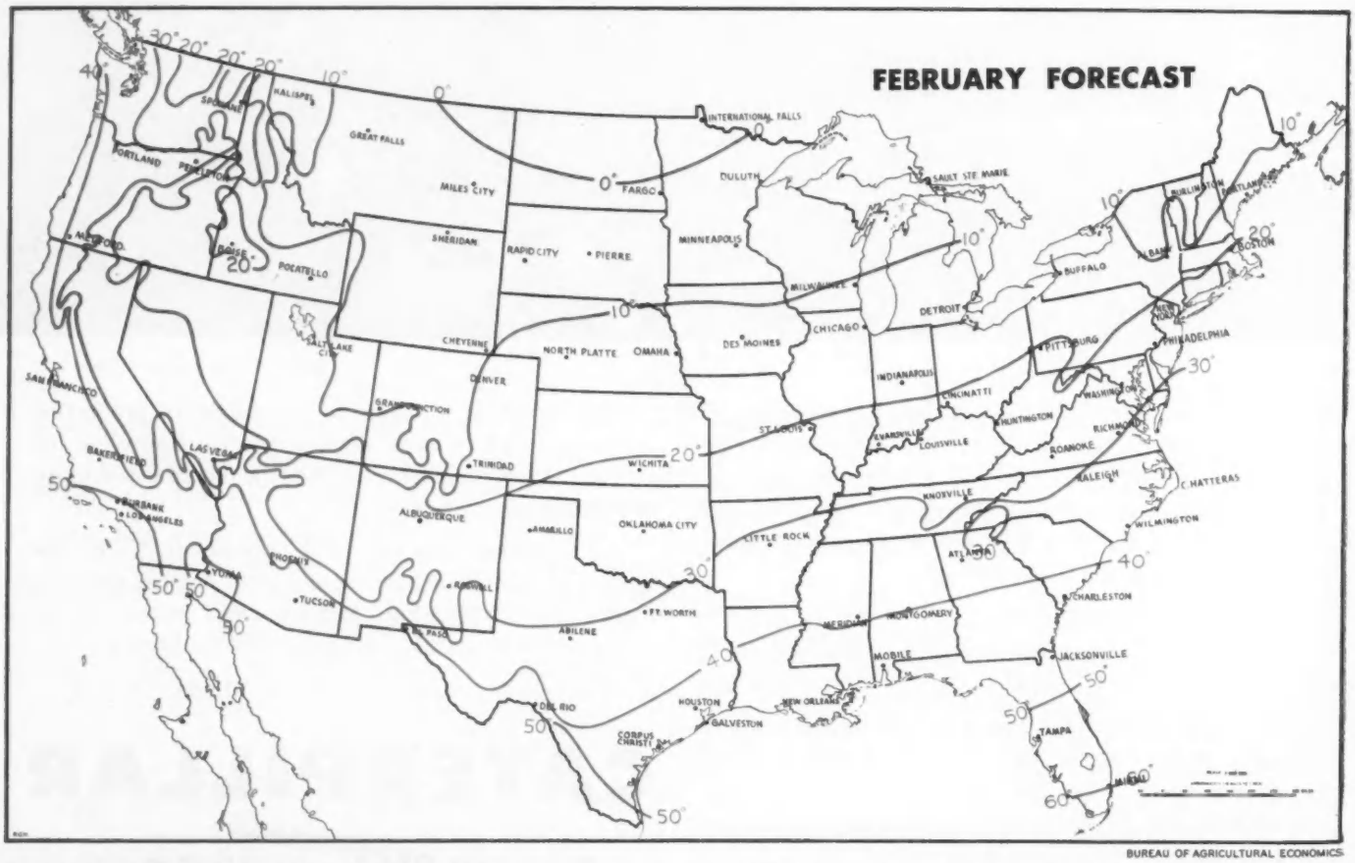

WHAT'S THE WEATHER?—Rigs operating in a line extending from Kansas northward can expect anti-freeze weather in January. During February a general warming up is anticipated along Gulf Coast and in northern portion of U. S. But protective clothing and shelter will still be in order. Information based on records of 600 first line U. S. Weather Bureau stations over a period of 50 years.

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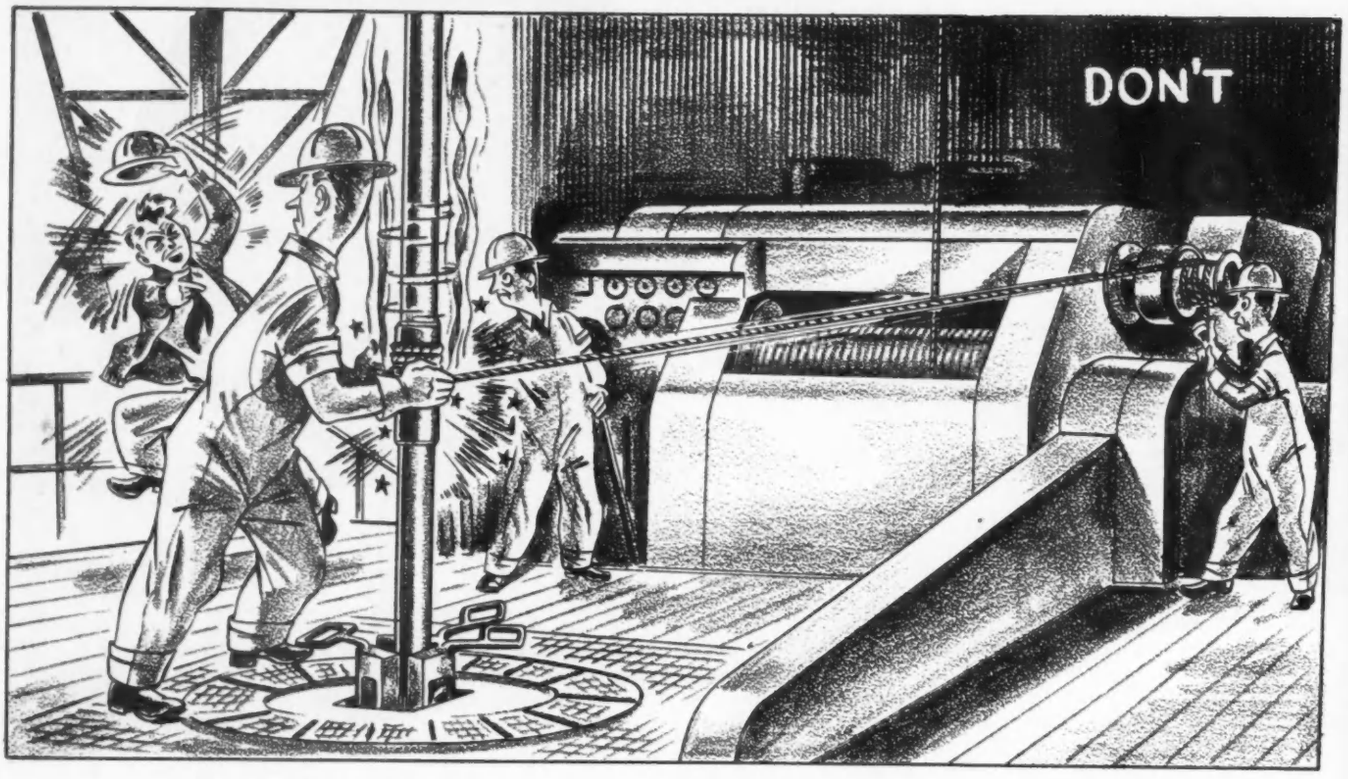
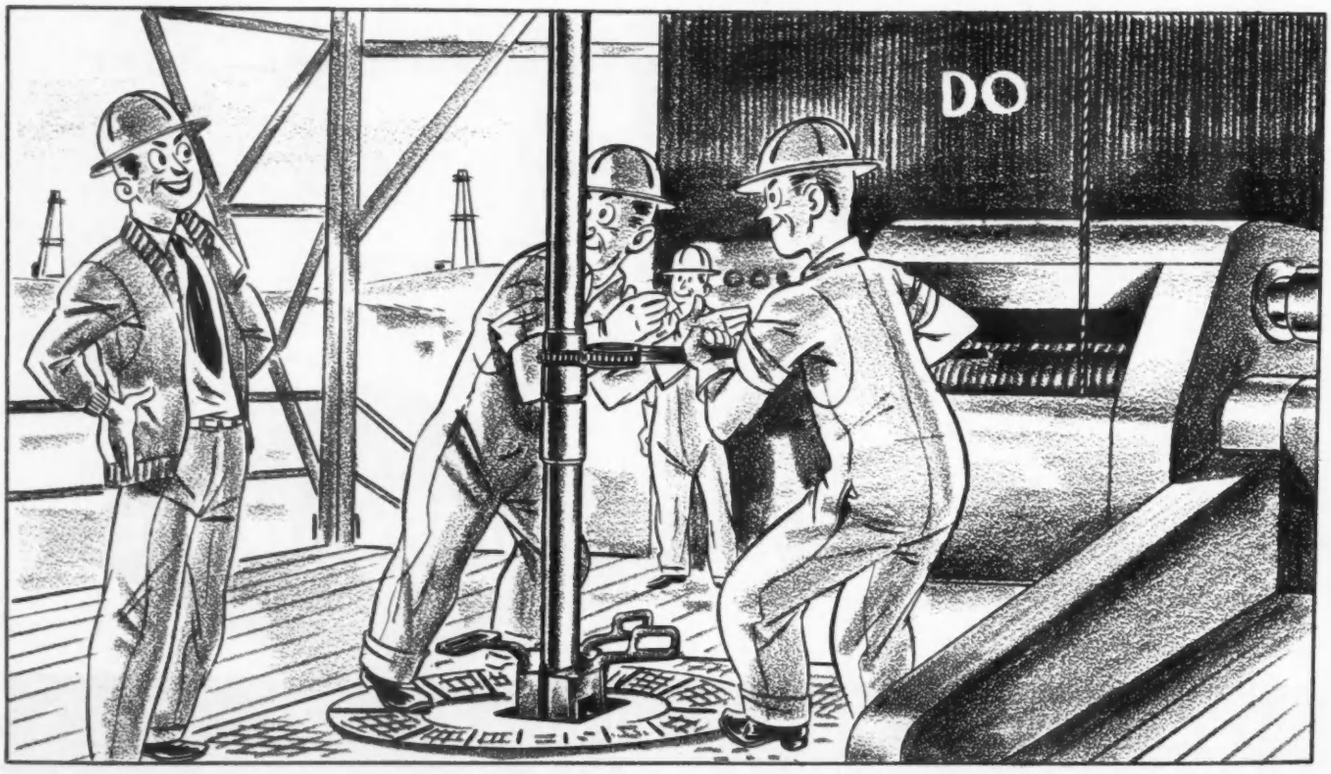
New Tool Joint Care



Threads of new tool joints are galled or burned if made up or broken out too fast.



Use tongs to make up new tool joints for first few trips, until new threads are broken in.

Precautionary measures against fire are commendable, but preventive steps to control the gas are more important in combatting the . . .

Hazards of Drilling With Natural Gas

By L. S. FULLER, Drilling Superintendent,
El Paso Natural Gas Company, Farmington, N. M.

DRILLING WITH natural gas has enabled the industry to reduce drilling time and cost on many wells, despite hazards of fire and asphyxiation. Because of its economic availability, gas has been successfully used in many areas since C. L. Perkins, vice president and manager, Drilling and Production Department, El Paso Natural Gas Company, introduced it in the San Juan Basin in 1951. Its acceptance has come about in areas where producing formations were not conducive to ordinary rotary drilling because of high mud loss to formations and subsequent blocking of gas by heavy mud. Cable tools were not effective due to length of time necessary to drill, and the many fishing jobs encountered.

The practicality of gas as a drilling fluid has been confirmed when proper precautionary measures have been taken. (Compressed air is contemplated when well locations become too isolated to warrant the running of gas line to the rig.)

Safety Precautions. Slight modifications of existing rotary drilling equipment and procedures are necessary when drilling with gas. The wellhead equipment is most important and must be checked frequently. A master gate is installed on top of the tubing head, above which is mounted a blowout preventer which may be closed hydraulically in two seconds. (Manually operated preventers frequently require as much as three minutes to close.) The connection which connects the drilling head, blowout preventer and flow line is actually a "T," which is installed on top of the blowout preventer. The flow line is of sufficient capacity usually of six-inch pipe or greater which carries escaping gases and cuttings away from the rig. Its usual length is 300 feet and carries escaping gases to a point where they may be flared to open air.

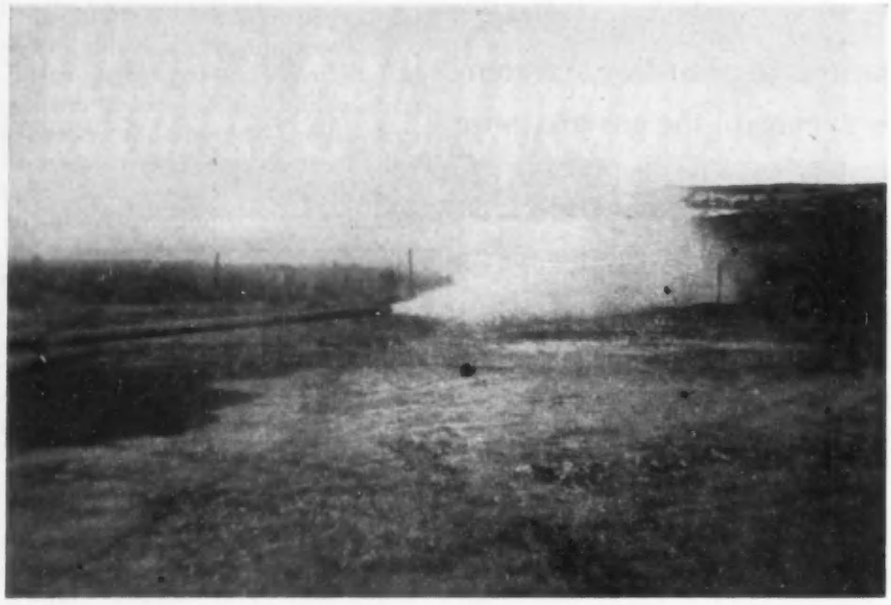
On top of the "T," or spool, the drilling head rotates with the drill pipe. Precautionary measures should be used to change the drilling rubber inside of the drilling head as often as wear, caused by vertical movement of drill pipe, demands. The arrangement described above is still used on most drilling-in rigs, with exception of rigs where space is available under the substructure for a double blowout preventer. The gas is supplied from the source through a four-inch line. As the gas moves from the source to the wellhead, it passes first through a heater, then to a dehydrator, to a separator, and then into the mud line. Precautionary measures have been taken to bury the line from the separator to the riser at the mud line and to install a shut-off valve in the supply line at a safe distance from rig.

GAS DRILLED WELL after being shot with 1800 quarts of solidified nitroglycerine without loading the hole with any fluid.

Checking for Leaks. The only departure from normal running-in procedure when running drill pipe in the hole is that the source line block valve and master control valve at the standpipe are closed while the blowdown line valve in the standpipe is open. At desired depth, the kelly is attached in usual manner and preparations are made to begin drilling. First, the block valve on the source gas line is opened and gas pressure is allowed to come up to the master control valve on the standpipe. A meter installed near the block valve records the amount of gas that goes through the system. Before drilling begins, a check is made for leaks in the line to this point.

Preparing to Drill. The standpipe master control valve is then opened and gas is allowed to flow for several minutes to assure a thorough cleaning of the system, and to make certain the drill pipe and bit were not plugged during the running-in of the drill pipe. After a thorough check of the system for any possible leaks the flare is ignited. It is recommended that the flare be located 300 feet from the rig. The flare may be lighted manually or by a pilot light which insures instant lighting of the flare when operations start up following a shut down.

Making Connections. When the kelly is drilled down, gas is allowed to flow for several minutes in order to remove the last cuttings from the hole. Cuttings are brought to the sur-



CUTTING DUST and gas discharge line should be positioned a safe distance from the well to prevent hazardous conditions.

face at the rate of 3000 feet per minute. When making a connection, the master control valve on the standpipe is closed. The kelly is picked up off bottom and the standpipe blowdown valve is bled off allowing the pressure to drop to zero as read on the standpipe gauge.

It is significant to note that the hazard to personnel or equipment is no greater than would be expected with conventional drilling methods if the standpipe control valve and the blowdown valve are operated as described above and the system is kept clean each time the drill pipe is broken out. The fittings should be inspected periodically and all gas should be let off and flared at a safe distance from the rig.

Hazards of Gas Drilling. Use of gas as circulation medium poses safety problems in addition to regular applied drilling rig safety. The fire hazard is greatly increased and every precaution must be taken.

Natural gas is not poisonous or asphyxiating, unless hydrogen sulfide is present, therefore, gas in itself is not dangerous to personnel.

About Gas Fires. Gas well fires are considered easier to extinguish than oil well fires, because gas is completely consumed and the flame is confined to a well defined column of no great thickness. The force of flowing gas and scarcity of oxygen, about the periphery of the ascending stream, usually prevents gas from burning until it is well above the outlet. As the column ascends, however, air is drawn in and mixed with gas so that it burns freely. If the gas flow can be momentarily interrupted, it usually will be extinguished.

Fire Fighting Equipment. Generally CO_2 fire extinguishers are used first, because of their availability. Large chemical fire extinguishers are located strategically about the drilling location. Both types of extinguishers are subject to regular inspections by the safety engineer, and are kept in good operating condition.

If a flame cannot be put out immediately with the fire extinguisher, mud guns are used.

- Precautionary measures must be taken to install mud guns around rig floor and under substructure, and slush pits must be kept full.
- Asbestos suits are kept at each rig for additional protection, to be used in emergency cases.
- Men in the field are in constant radio contact with the rigs from mobile radios installed in each company car. Radio is a great safety factor.
- The crews are given instruction in fire fighting and have fire stations assigned to them.

Placing Safety Valves. The source gas line block valve is located some distance from rig so that gas used for drilling can be readily shut off in the event of fire. Some operators install set of controls for the blowout preventers some distance from the rig floor. This is a safety measure in event escaping gas from the well catches fire, the rams could be closed, thus shutting off the gas.

Although precautionary measures against fire are commendable, preventive measures involving control of the gas are of greater importance.

Natural Ventilation. This should be considered when selecting the well site. Good ventilation is necessary to keep any gas from accumulating around the rig, especially in the vicinity of the motors and under the substructure. When the rig is winterized, the substructure should not be boxed in completely. One end is left open and vents are provided.

If natural ventilation cannot be obtained due to the terrain or the geological necessity of drilling in a certain spot, then artificial ventilation is set up. Use of large fans such as the type used for "bug blowers" in the Gulf Coast area are common. These fans have five-foot blades and are driven by spark-proof electric motors.

Electrical System. Sparks from electrical system are eliminated by special lighting systems. All wiring is heavily insulated. Light bulbs are encased in heavy glass cases, and enclosed in a wire cage. A drop cord is used under the rig floor in an emergency only.

Electric motors are spark-proof and all wiring under rig floor is in conduit. A master switch is installed so that it is accessible to the driller at all times. All wiring installations should be by a licensed electrician.

Types of Motors. Diesel motors have no outside spark that might ignite a fire. The flash-point of diesel fuel, being lower than that of gasoline, decreases the possibility of an explosion or fire. All exhaust manifolds should have water running through them, and should be placed lower than the engine. The exhaust should extend at least 50 feet from the derrick. If gasoline motors are used, a control switch

Continued on Page 136

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New Well Logging Developments

• Do you know what types of logs to use under various conditions?

• Here's a list of methods that will help in making the proper selections.

By L. A. PUZIN, Schlumberger Well Surveying Corporation, Oklahoma City

4. Distinction Between Limey and Oil Bearing Sands

A frequent problem faced in interpreting logs in hard rock countries is how to distinguish limey from oil bearing formations. The problem can be explained as follows:

The resistivity of a porous formation is expressed by the Archie formula:

$$Rt = \frac{FRw}{S^2w}$$

Consider the formation water resistivity Rw as fairly constant in a given section. Furthermore, we have seen that formation factor F is a function of porosity. Consequently, the above formula shows that resistivity Rt depends upon two independent values:

1—Porosity of the formation:

$$\phi = \sqrt[m]{\frac{a}{F}}$$

2—Proportion Sw of water in porous space.

It is evident, therefore, that the high resistivity of a formation may indicate either hardness or oil saturation. The problem is not too critical in unconsolidated sands where the formation factor is relatively low. Conversely, in very hard rocks, the SP curve is likely to show a lack of porosity and therefore, eliminate the possibility of oil saturation. But in porous and cemented formation, there is always an element of uncertainty in interpreting the log for fluid content.

A solution to the above problem is now offered by the microlog. If the high resistivity observed on the standard log is due to hardness, the microlog shows high values. If the high resistivity is due to oil saturation, the formation is porous and therefore, the microlog gives lower values.

An example of such a distinction is exhibited on Figure 6. The conventional electric log shows two similar peaks of resistivity between 4097 and 4154 feet. However, the microlog indicates a considerable difference between the two zones. The resistivity at 4097-4123 feet is due to oil saturation whereas the comparable resistivity at 4127-4154 is mostly caused by hardness.

About the Author

L. A. PUZIN is division manager for Schlumberger Well Surveying Corporation with headquarters in Oklahoma City. A native of Paris, France, he graduated from the University of Paris and joined the Schlumberger organization in 1928. He did geophysical and well logging work in France, Africa, South America, Texas, and Oklahoma. He has been in the U. S. since 1935 and is one of the pioneers who developed electrical logging in hard rock countries.

Part 2

5. Salty Mud Problems

The problem of logging salty mud holes is not as important in Oklahoma as in other regions such as Kansas or West Texas. However, it arises in the northwestern part of the state. The techniques currently applied in salty mud holes are:

Combination gamma ray—neutron.
Combination gamma ray—Laterolog-microlog with or without the addition of the microlaterolog.

Gamma ray-neutron recording is not affected by the kind of mud and can even be carried out without any mud at all or in cased hole. It is therefore well suited to salty mud surveys. The gamma ray log gives a good distinction between shale and non-shaley material. Discrimination between sands and limestones is possible although not too easy.

As explained in Section 2, the neutron curve shows the disinction between dry and fluid carrying strata. It also allows a calculation of the porosity. The chief disadvantage of the combination gamma ray-neutron is that it cannot be used to determine oil saturation even qualitatively.

Combination gamma-ray laterolog-microlog is widely used for salty mud surveys. Such a combination furnishes the following data:

- Lithological logging from the gamma ray log
- Porosity from the microlog or microlaterolog
- Oil saturation from the laterolog.

6. Logging in Oil-Base Mud and In Cable Tool Holes

Logging problems in oil-base mud

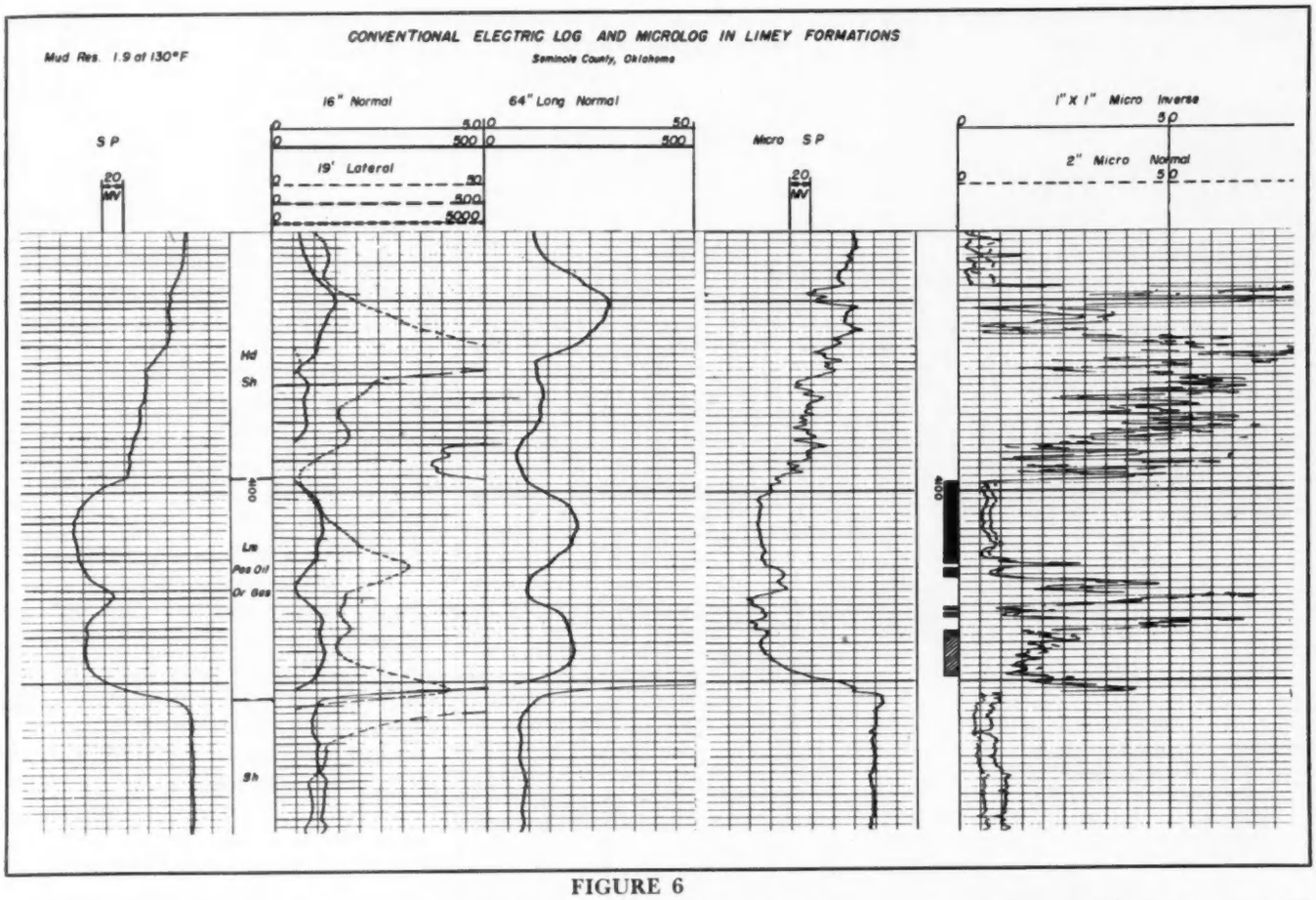

FIGURE 6

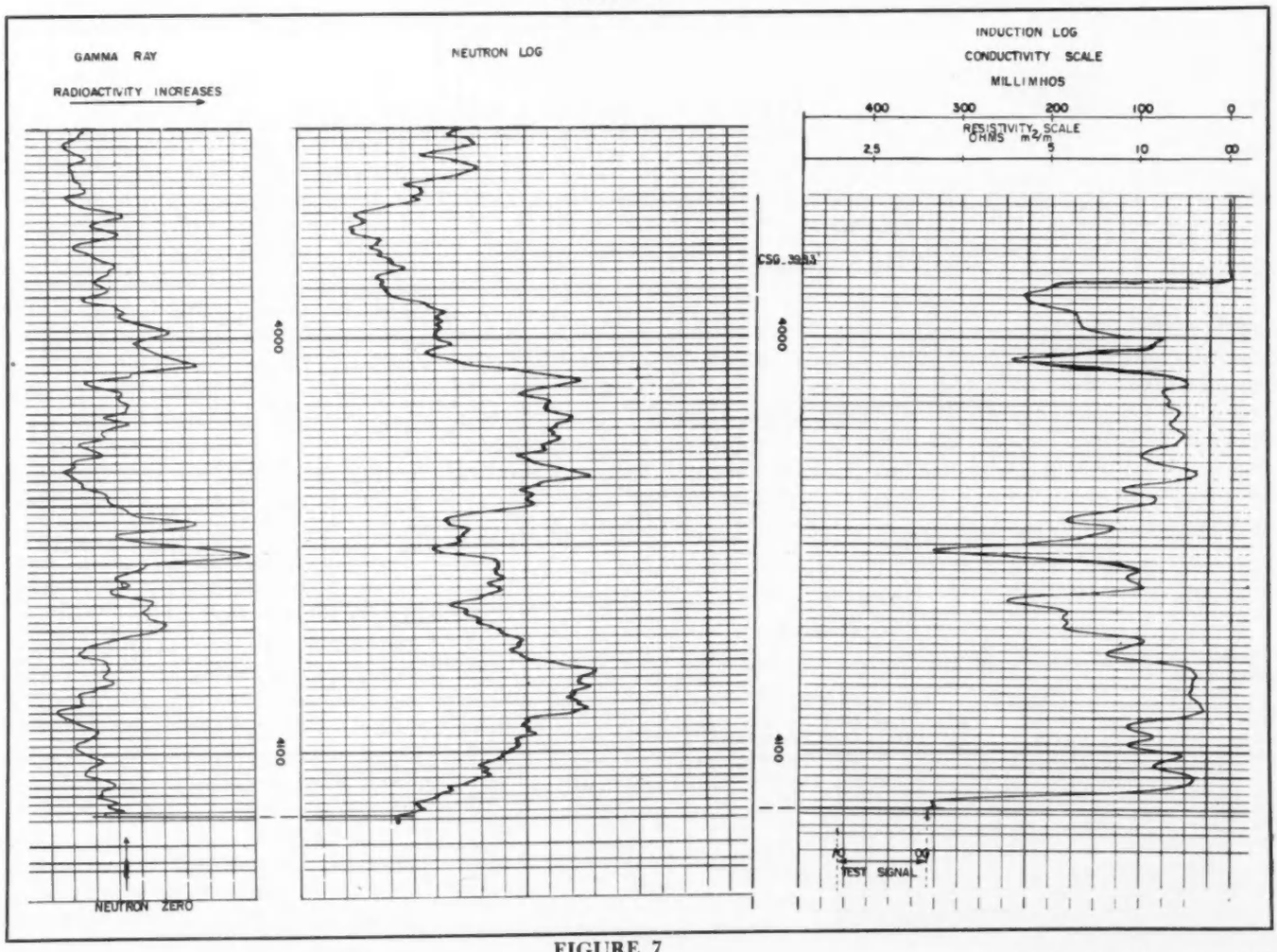

FIGURE 7

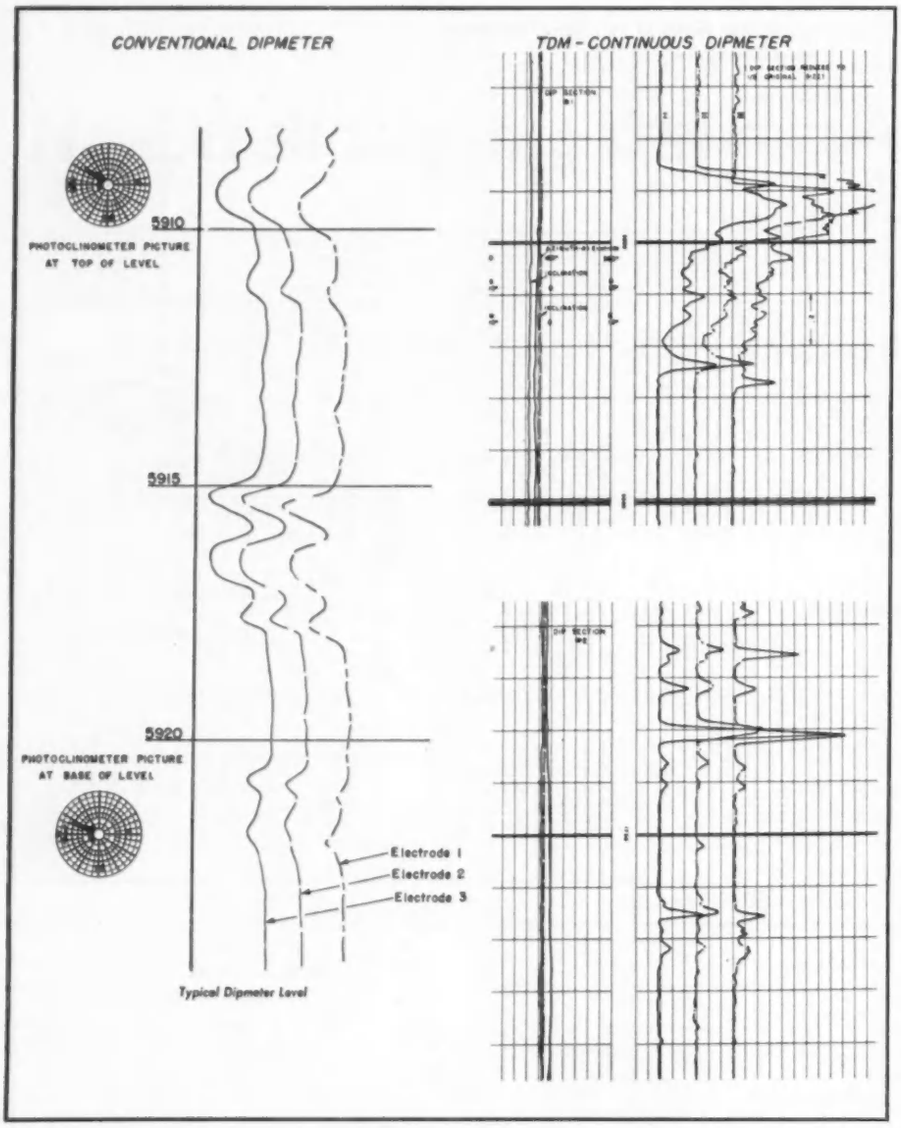

FIGURE 8

(Part 2 Fig. 8, next page)

and in cable-tool holes are closely related inasmuch as neither an oil-filled nor an empty hole offer any conductor for the use of conventional electrical logging devices. Oil-base mud is seldom used in Oklahoma but cable tool wells are extensively drilled for secondary recovery.

The technique applied to oil-filled and empty holes is a combination gamma ray neutron-induction logging. (See Figure 7.) Such a combination furnishes the following data:

Lithological logging from the gamma ray log

Porosity from the neutron curve

Saturation from the induction log and salinity charts.

(Saturation is obtained by applying the Archie Formula [Section 3] which requires the determination of Rt, F and Rw. True resistivity Rt is given by the induction log. F is derived from the porosity. Rw is given by direct measurements on samples of connate water. Sample measurements are compiled in so-called "salinity charts.")

Cable tool holes can often be filled with fresh water, at least over the producing section. In such a case, they can be logged as any rotary wells, by conventional methods.

TABLE 1

KEY TO SYMBOLS

Rm: Mud Resistivity (A mud is called "fresh" when its resistivity is about five times the resistivity Rw of the formation's connate waters).
>: Larger than. <: Smaller than. *: ML will be substituted if MLL not available. **: ML may be omitted as MLL comes into more general use. SP: Self Potential Curve. R: Conventional Resistivity Curves.
ML: Microlog. LL: Laterolog. MLL: Microlaterolog. GR: Gamma Ray Curve. N: Neutron Curve. I: Induction Logging. MCD: Microlog Continuous Dipmeter. CARTER: Carter Dipmeter.

	FRESH MUD Rm > .4	SALTY MUD Rm < .4	OIL OR EMPTY
Thick formation (> 10')	SP-R-ML	GR-LL-MLL*	GR-N-I
Thin beds between Shales.....(Sands)	SP-R-ML	GR-LL-MLL	GR-N-I
(Limes)	SP-LL-MLL-ML**	GR-LL-MLL-ML**	GR-N-I
Thin porous beds in dense zones	SP-LL-MLL-ML**	GR-LL-MLL-ML**	GR-N-I
Dip Measurements (Thick beds)	MCD	MCD	CARTER
(Thin beds)	MCD OR CARTER	MCD OR CARTER	CARTER

7. Progress in Dip Measurements

The importance of dip measurements is being more and more realized in Oklahoma as a result of the raise in cost of drilling and the increasing difficulty in finding new fields. The demand for improved dip measuring devices was met by the development of so-called "continuous" dipmeters.

Dipmeter instruments have been used for many years. They were based on the simultaneous recording of three curves either self potential or resistivity. Dips and direction of the formations were calculated from the relative displacement of the recorded curves. To complete the computation, it was necessary to measure the inclination of the hole as well as the orientation of the recording electrodes. This was done by taking the photographic picture of a pendulum for inclination and of a compass for orientation. Hence, a set of measurements for curve displacement, hole inclination and electrodes orientation had to be performed at each level where a dip computation was sought. (See Figure 8.)

The new dipmeters now available in Oklahoma give a continuous record of all data necesary to compute the dip and strike at any given point of the recorded section. (See Figure 8.) With type A dipmeter, the dip measurement is based on the correlation between three hole profiles. The microlog-continous dipmeter (MCD) makes use of the correlation between three microlog curves. Accordingly, each one has different fields of applications.

The MCD is of more general application in standard rotary wells. Type A dipmeter can be used in holes drilled with oil-base mud. It will also

TABLE OF VERTICAL DISPLACEMENT IN FEET CORRESPONDING TO VARIOUS HORIZONTAL DISTANCES AND ANGLES OF DIP

Dip Angles (degrees)	Vertical Displacement for Horizontal Distances of 100	1000	1 mile (5280')	Dip Angles (degrees)	Vertical Displacement for Horizontal Distances of 100	1000	1 mile (5280')
1	1.75	17.5	92.2	19	34.4	344	1818
2	3.5	35.	184.	20	36.4	364	1922
3	5.2	53.	277.	21	38.4	384	2027
4	7.0	70.	369.	22	40.4	404	2133
5	8.8	88.	462.	23	42.5	425	2241
6	10.5	105.	555.	24	44.5	445	2351
7	12.3	123.	648.	25	46.6	466	2462
8	14.1	141.	742.	30	57.7	577	3048
9	15.8	158.	836.	35	70.0	700	3697
10	17.6	176.	931.	40	83.9	839	4430
11	19.4	194.	1026	43	100.0	1000	5280
12	21.3	213.	1122.	50	119.2	1192	6293
13	23.1	231.	1219.	55	142.8	1428	7540
14	24.9	249.	1316.	60	173.2	1732	9145
15	26.8	268.	1413.	65	214.4	2144	11322
16	28.7	287.	1514.	70	274.8	2748	14507
17	30.6	306.	1614.	75	373.2	3732	19705
18	32.5	325.	1716.	80	567.1	5671	29945

To obtain vertical displacements corresponding to multiples of hundreds feet, thousands of feet or miles, multiply the number found in the table by the number of hundreds, thousands or miles

Example: The formation dip is 16 degrees. The vertical displacement occurring at a spot 660 feet away from the well is desired. The table shows 28.7 feet per 100 feet for 16° dip. Therefore 28.7 x 6.60 = 189.42, or 189. feet.

Sta. No.	Depth Interval	From Magnetic North: Drift Azimuth	Drift Angle	Orientation Reg.	Displacement of correc. in reference to I	II	III	Direc. Hor.	Dip	From True North: Average Direction	Av. Dip	Graph of Direction	Remarks
	1200 to 1222	0	0	95	No Consistent Dip or Trend								
	to 1518	225	1.2	94	U1.6	U1.1		132	36	S-37-E	34		
	2070 to 2090	243	2.2	93	0	U2.2		148	17	S-22-E	17		
	2164 to 2190	238	2.6	210	U1.7	D0.6		126	17	S-46-E	15		
	2434 to 2438	248	3.2	25	D1.6	0		132	15	S-38-E	15		
	2550 to 2560	254	3.3	63	D2.7	U1.2		158	27	S-12-E	27		UNCONFORMITY
	2620 to 2626	243	3.2	98	U8.0	U3.4		57	47	N-67-E	47		
	2660 to 2668	255	3.2	67	U6.3	U6.2		64	43	N-74-E	43		
	3390 to 3400	248	2.7	315	D1.0	U4.3		28	37	N-48-E	35		
	3885 to 3895	210	4.0	133	U0.5	D8.0		13	53	N-26-E	52		
	to												
	to												
	to												
	to												
	to												
	to												
	to												

FIGURE 8 (Part 2)

give good results in any well where sharp variations of hole size exist.

For more information on the type A dipmeter, see F. G. Boucher et al.[10] The MCD is described in P. de Chambrier.[11]

CONCLUSIONS. In view of the multiplication of logging methods, selecting the proper type of service for any given problem may be sometimes embarrassing. Table 1 will help in the selection. —**The End**

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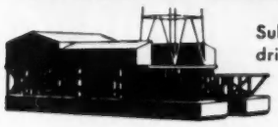

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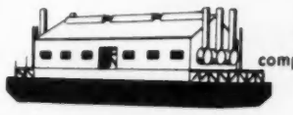

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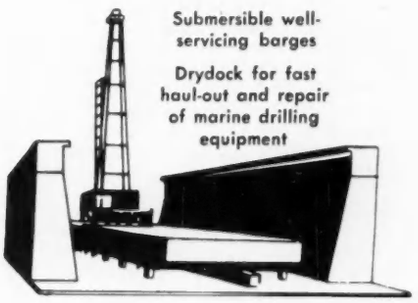

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Hazards of Drilling with Natural Gas

Continued from Page 122

should be installed so driller can stop motors without leaving his post.

Gas Leaks Detected. A gas leak can be ascertained by various means. The most common is a whistling sound, quite audible, since the gas is under high pressure. A gas leak can be seen if well is dry—a fog will form around the line or valve. If the well is wet, moisture will be present on offending part. It is also possible to smell gas, because of its distinct odor. An experienced driller can detect the smallest leak, in any part of the system, usually by sound.

General Precautions. Any unprotected metal surface that could cause spark is a possible source of fire. All movable metal objects, suspected of vibration or movement, are rubber insulated at point of contact. All tools are brass wherever possible. Careful attention is given to the greasing of the rotary table and drawworks machinery.

Educating drilling crew personnel to problems encountered with gas drilling has been of prime importance. Operation of various valves and the bleeding-off of large volumes of gas at high pressures requires close surveillance by experienced supervisors until crews have become indoctrinated. Selection of men for drilling crews on gas drilling rigs requires more careful selection and screening than is generally prevalent in the drilling industry.

Crews have no objection to working with gas drilling and apparently like the cleanliness feature of the operation. Cleanliness eliminates danger of injury by slipping on mud-covered floors. Crews are carefully instructed in inspection procedure and correction of faulty mechanical equipment. Each member of rig crew is continually cautioned against smoking near rig. No member of the crew is permitted to bring cigarettes, matches or lighter on rig floor. No unauthorized person is allowed on the rig floor during gas drilling operations. Caution signs are placed conspicuously about the rig as a constant reminder against smoking.

Conclusion. After two years' experience, and several hundred wells where the gas circulation technique was used, it can be said that little danger of fire exists if reasonable precautions are taken and ordinary safety rules observed. There have been three or four fires in the San Juan Basin, but none of these have been during the actual drilling operation. The fires have been traced to carelessness on the part of rig personnel and happened while running tubing or while out of the hole changing the bit.

Observe these simple rules for safe operations.

- Close the main control valve at standpipe and open standpipe blowdown valve before breaking out a joint in drill string.
- Keep return lines open and flare gas at safe distance from the rig, then gas in the annular space between drill pipe and hole will be properly vented; then it will only be necessary to vent drill string before breaking a joint.
- Driller must watch gas pressure and volume going through system.
- Properly train crew and inform them of hazards and precautions.

Carelessness of rig crews remains the greatest potential danger and must be alleviated by constant and rigid training and supervision. Team work on the part of the entire drilling organization must be continually the aim.

ACKNOWLEDGMENT

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This article is a condensation of a paper presented before the National Safety Council, in Chicago, October 21, 1953.

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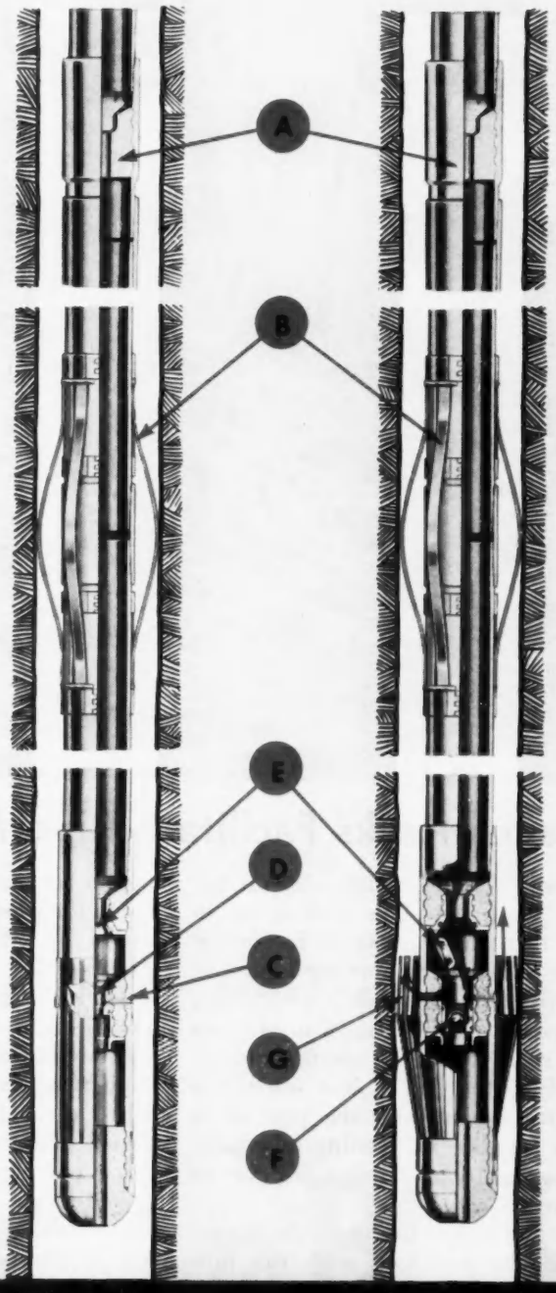

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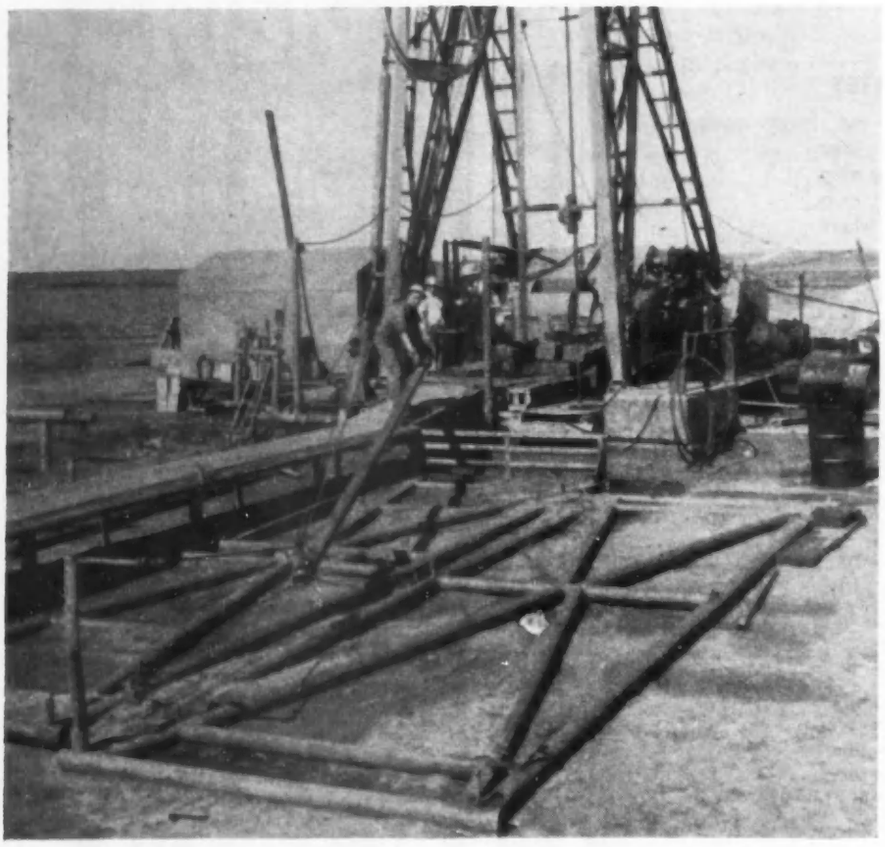

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As illustrated, the racks are placed beside the walkway with the pipe loaded thereon from the last location. As the joints are fed into the hole, the racks are emptied and when the time comes to single down the pipe, the arrangement shown is made.

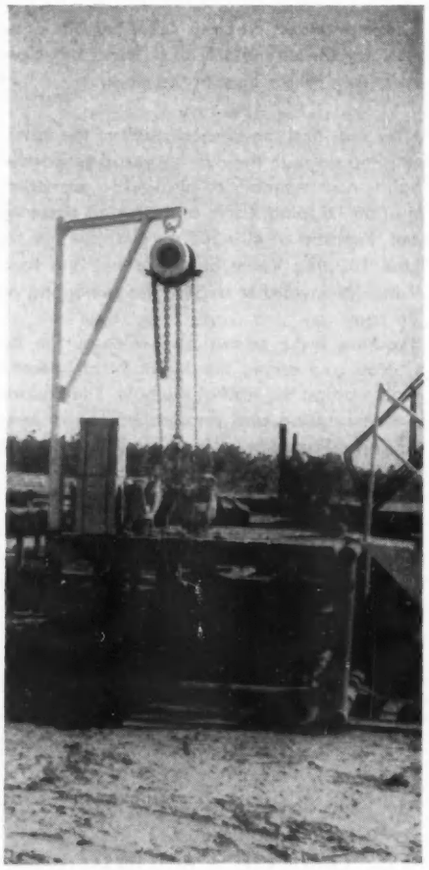
The post welded to the corner of the outside rack carries the line leading up to a point in the derrick on which the pipe is carried out. A short arm is placed in the corner post to spot the pipe over the rack. This is swung around when the pipe is going into the inside rack.

From the derrick floor, when the joint is unscrewed, the pin end is thrust through a loop which is connected to a pulley which rides on the carry out line. The pulley is connected to the top of the derrick and back down to a cathead. Another cat line is used to control the front end of the drill pipe in the usual manner.

As soon as a load is made, it is fastened down and there is no delay when the truck comes, as it is sucked up on the back of the truck with the winch line and easily unloaded at the next location.

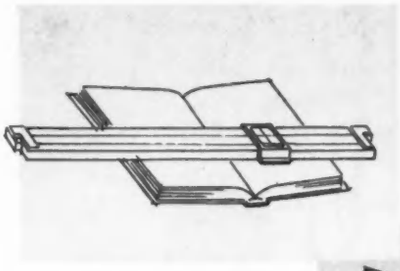
Inexpensive Davit Crane Expedites Loading

Taking the work out of loading and unloading heavy material is done with a simple and inexpensive davit type crane attached to one corner post of the bit dock. The dock is made of pipe and floored with common rig timber. The upright corner post supporting the crane is left open as a socket for the post, so that the crane and hoist can be easily removed or set up. The socket is capped with a flat sheet of steel, circular in shape upon which rides a thrust ball bearing unit so the crane can be easily rotated. Not

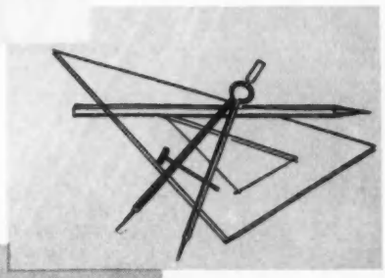


only does this apparatus remove much of the work around the rig, but loading and unloading are expedited.

at every step of the way



from engineer's calculations



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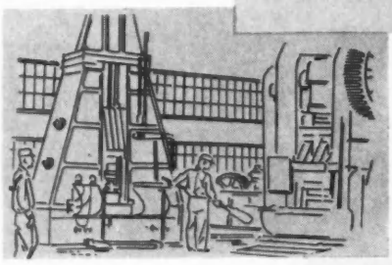
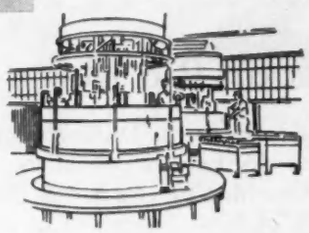
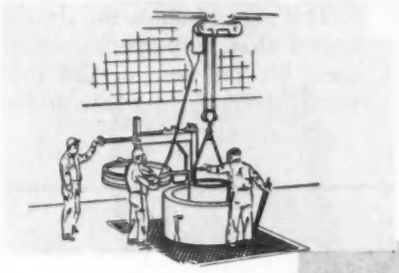


through forging the parts



and machining the legs



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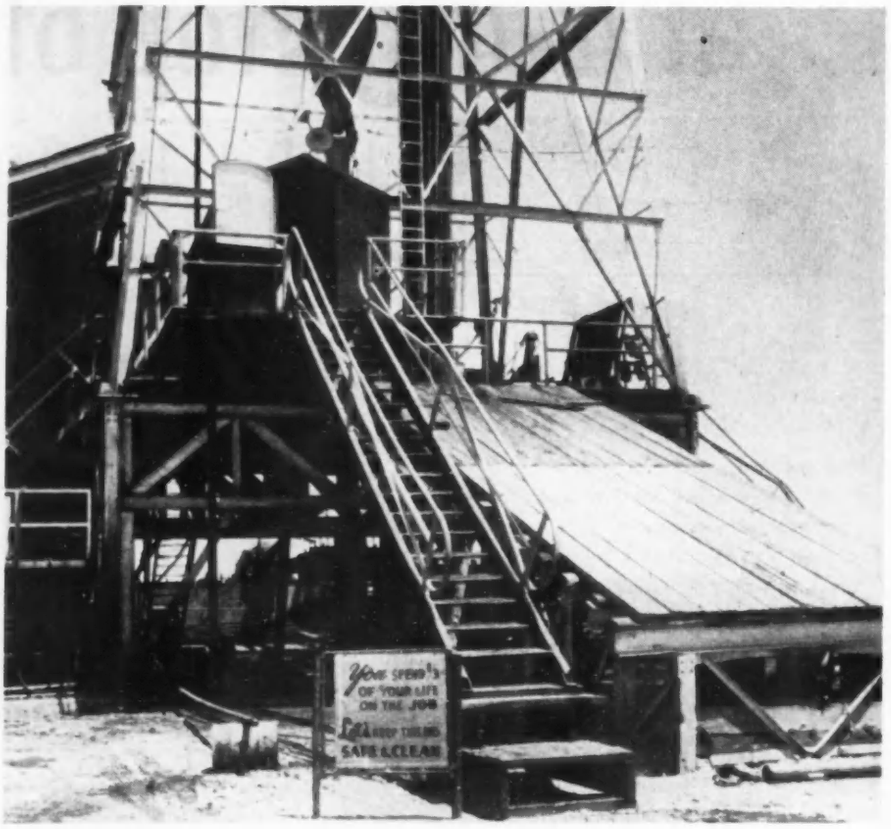
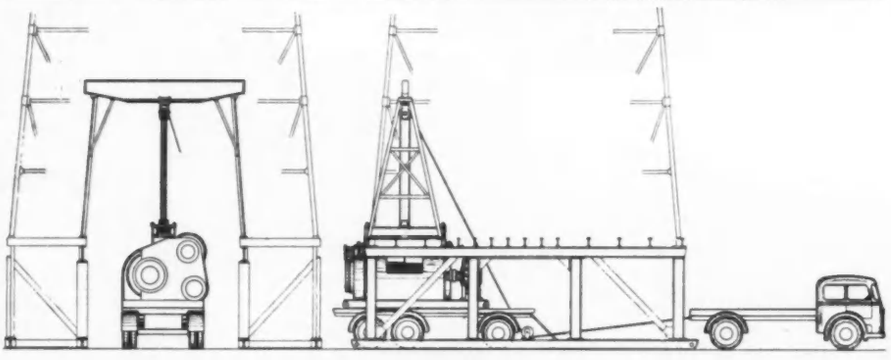


Signs on Rig Make Men Safety Conscious

The Southeastern Drilling Company has this reminder of safety on one of their drilling rigs in the Denton Pool of New Mexico. The sign has been painted on a boiler plate which has been fitted with a one-inch pipe frame and fits into the top of two two-inch pipes which have been driven into the ground beside the doghouse steps.

This sign reminds the drilling personnel that they spend one-third of their life on the job and that they should keep the rig safe and clean.



A-Frame Gin Pole Elevates Drawworks

The tough rigging up problem of elevating the drawworks to the derrick floor without the use of a powerful crane or a truck ramp has been solved by operators in Italy.

Affix two heavy reinforced gin pole "A" frames to the main substructure support members, as shown in the sketch. Either of the heavy beams supporting the rotary table is bolted on top of the gin pole frames. A travelling block is suspended from the

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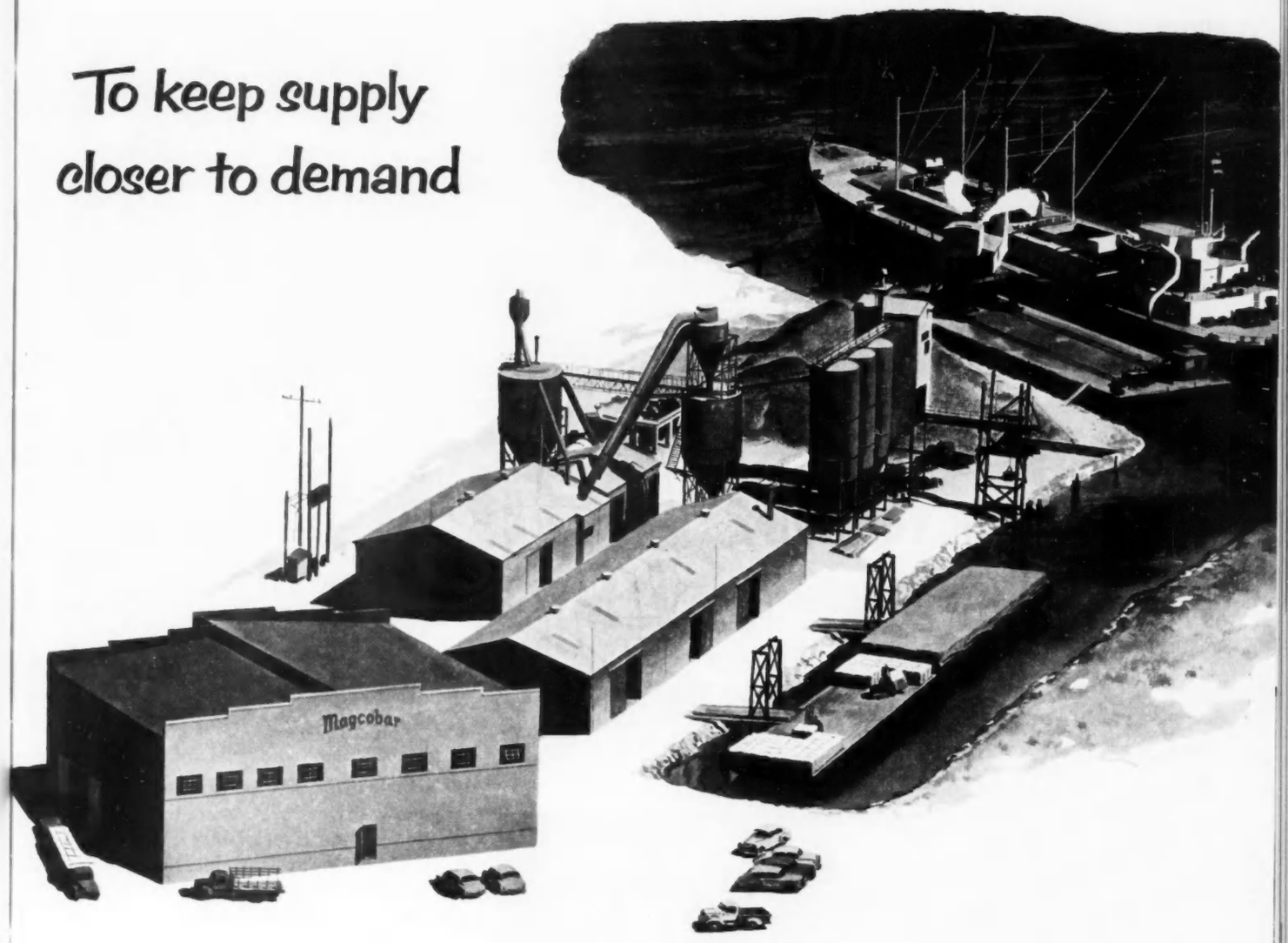

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Located on the Industrial Canal at New Orleans, this new Magcobar barite plant is strategically located to draw raw materials from throughout the entire world to meet future needs of the drilling industry. Close to Gulf Coast drilling activity on land and offshore, this new plant will enable Magcobar to supply highest quality barite to the industry at minimum transportation costs. This plant is another step by Magcobar in supplying the oil industry with highest quality drilling mud at the lowest possible cost. When you need mud, call your Magcobar Dealer. There are more than 400 in the United States and Canada.

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heavy beam.

Drive the drawworks truck between the twin boxes of derrick substructure, and lift to desired height by block and tackle method shown.

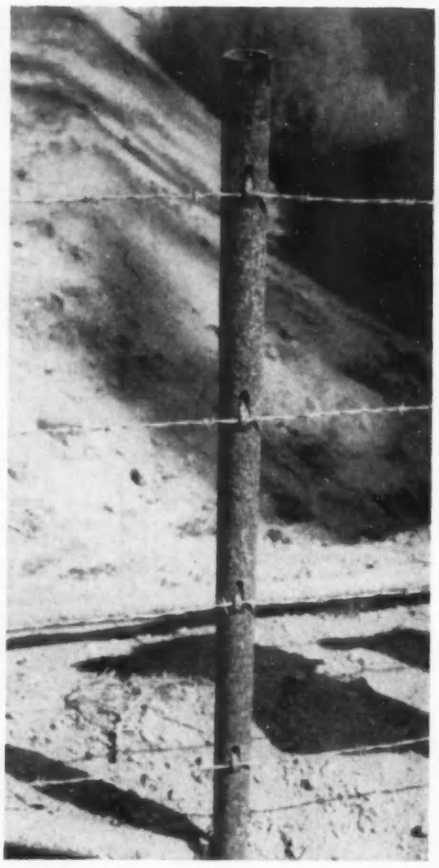
While the drawworks is still hanging above the floor the supporting beams are fixed in position. Drawworks is then lowered.

The gin pole frames and the rotary table beam are lifted by means of a truck-mounted crane of a limited capacity.

Slotted Two-Inch Pipe Makes Useful Fence Posts

One of the most difficult jobs concerned with erecting a barbed wire fence around a slush pit when using iron pipe as posts is keeping the wire safely in the required position. The job can be made so simple that anyone familiar with an acetylene cutting torch can prepare the posts quickly so the wire can be secured.

At the desired points up and down the two-inch pipe, cut oblong slots to relieve a tongue-shaped piece of metal



which can easily be pried out with a screw driver, or a wire line splicing tool, if one is available. The tongues are lifted out of the slots only enough to press the strands of wire against the post, then driving the tips into the slot again. There is no slipping up or down the post as when wire ties are used, and the fence can be removed quickly by lifting the tips outwards again.

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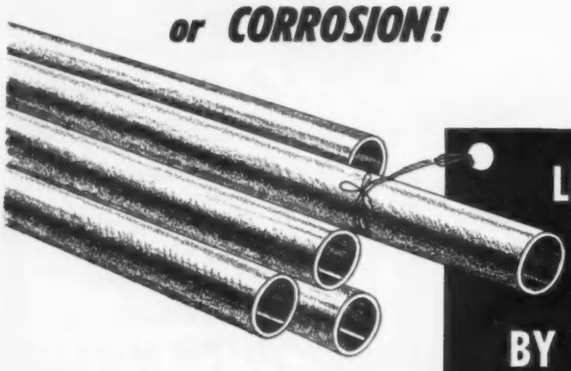

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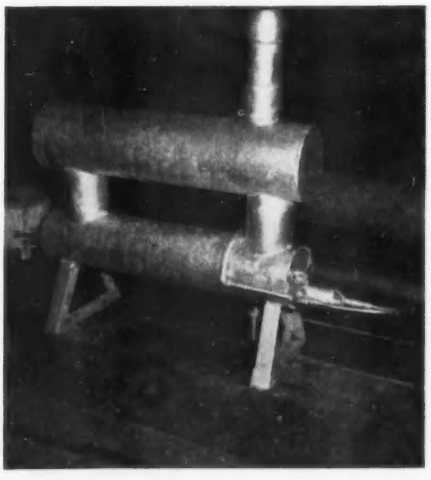

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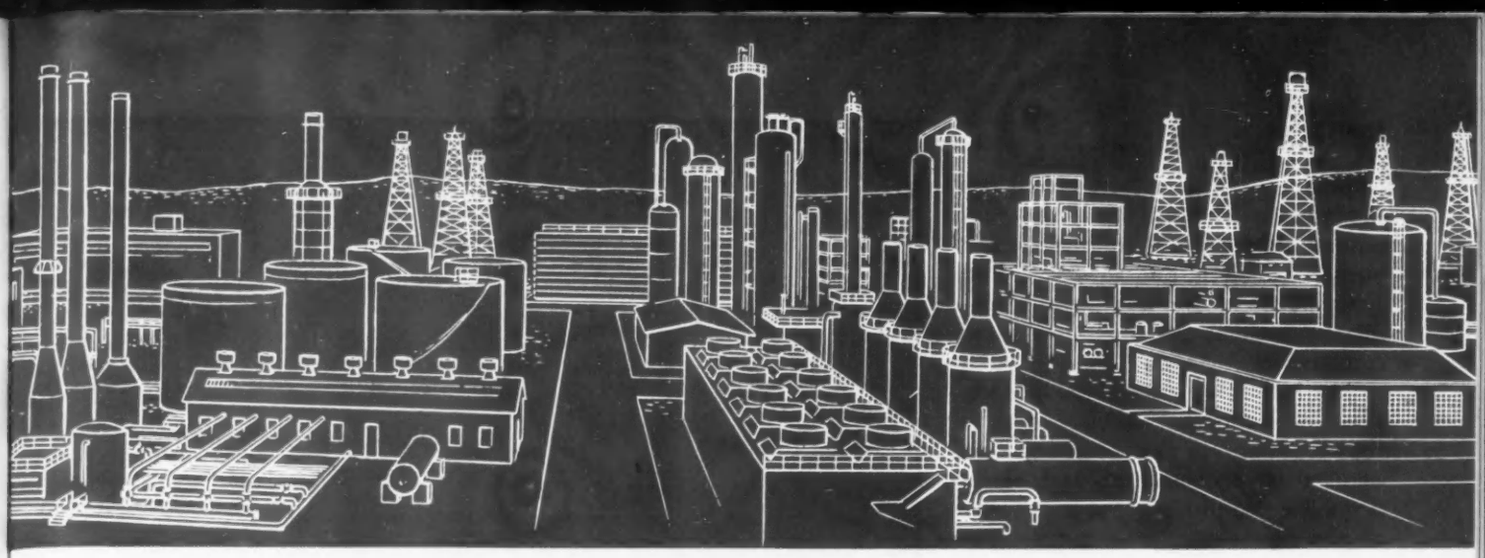

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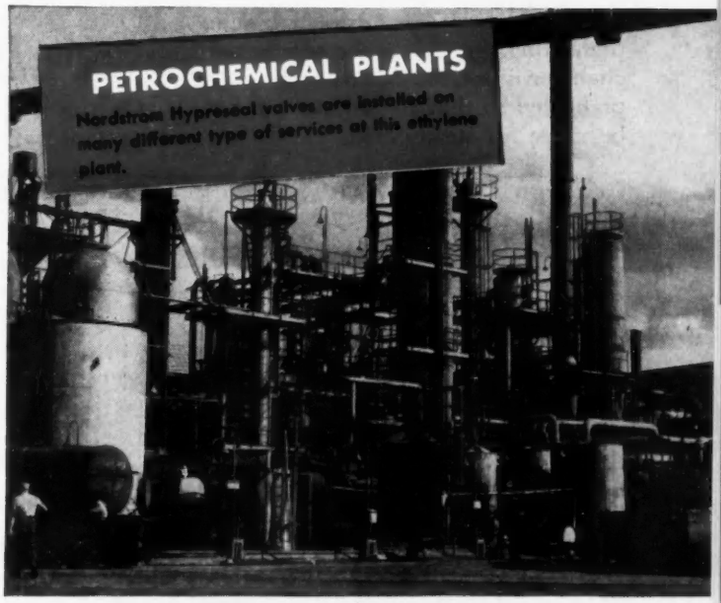
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Nordstrom Hypreseal valves are installed on many different type of services at this ethylene plant.

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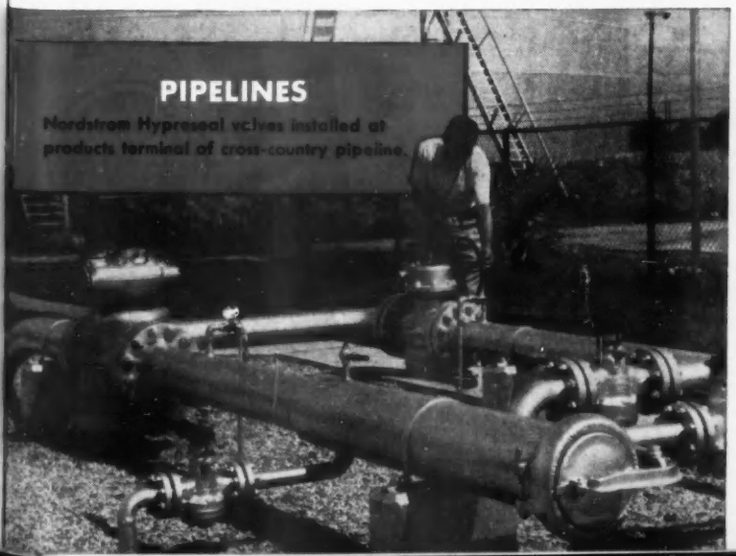
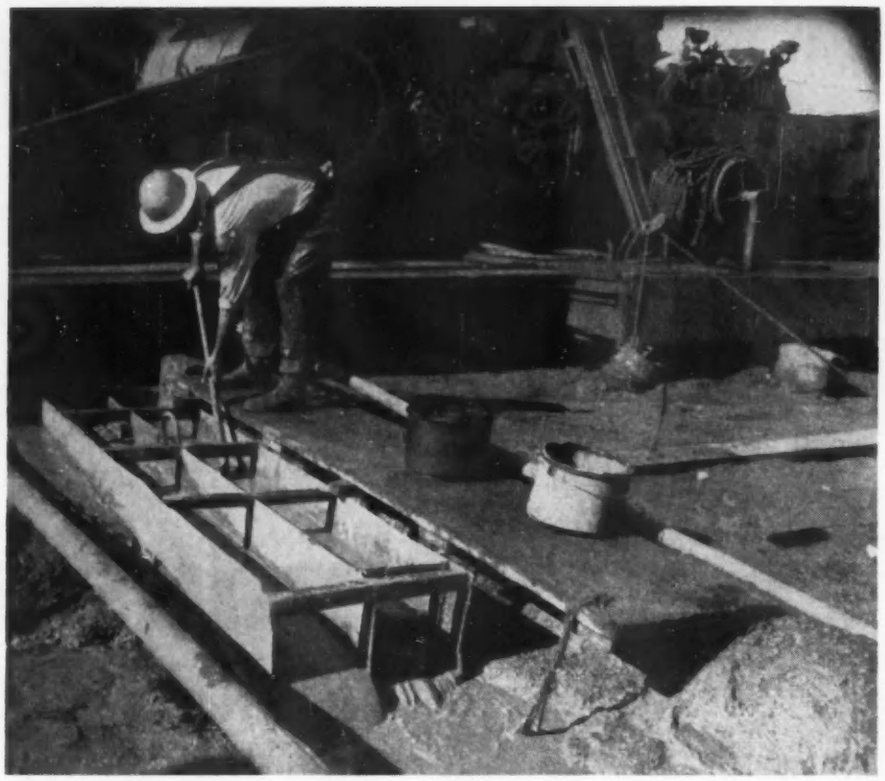


or butane in a space heater is to run the inlet line over the top of the combustion chamber just in front of the burner, which is one of the hottest spots in the stove and it will adequately preheat the liquid for rapid combustion.

The heater is made by welding sections of scrap seven-inch casing as shown. Two pieces of scrap are blanked off on both ends and legs of a smaller size pipe welded in between to give plenty of heating surface. The burner is made in the usual manner by welding a choke nipple inside a piece of two-inch pipe to form a jet type burner. Legs are made from scrap pieces of angle iron and the stack is made from a piece of four-inch pipe screwed into a collar welded to the top of the upper pipe.

In operation, the inlet valve is cracked and a small amount of fuel allowed to drip inside the firebox and ignited so that it burns directly against the pipe nipple above to cause rapid preheating. As soon as the combustion chamber is hot, the liquid is sufficiently preheated so that the adjustment can be made for steady heat.



Steel Flume Aids in Catching Samples

On rigs where the samples play an important part, build a simple flume in the mud line from the well to catch the samples. Build a flume from tank

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iron and conduct the mud from the blowout preventer to the mud ditch.

In order to catch a representative sample, approximately one-eighth of the mud stream is diverted into another flume built alongside the main flume. This flume has a wier on the lower end to cause the mud to slow in speed and give up the cuttings. The upper end also has a control so that a steady stream is carried over into the sampling flume.

On orders from the geologist, it is necessary for the mud man to simply shovel out the cuttings at stated intervals and dry them and clean out the flume so that another sample to represent another depth interval may be caught.

Skid-proof Platform Walk Provides Access to Engine

Build a platform walk for servicing large engines at mud pump installations to provide convenient access by repairman or operator. A mechanic can do his work in a thorough manner when steps, or a platform, are placed at a convenient height.

The engine illustrated has a conventional skid type base of structural steel so that the step can be installed without difficulty. The step or platform is fabricated by using heavy angle iron as the frame, with adequate intermediate cross member, which is covered with walkway grating. One side of the step is provided with heavy loops which engage hooks welded to the web of the "I" beam sill. At the lower flange of the sill are cups as sockets in which diagonal braces are set when the step is installed on the engine. It is so designed that, when installed, the floor is level and remains in position until intentionally unhooked for moving.

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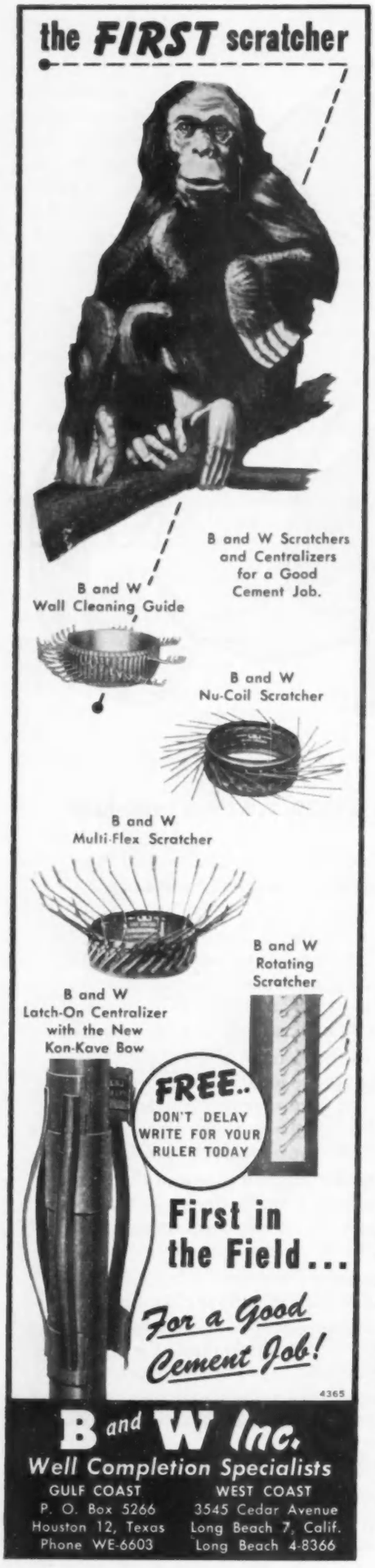
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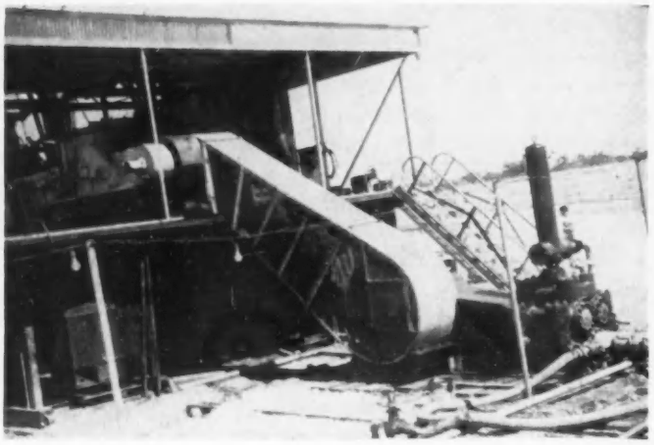
Hinged Belt Guard Made from Scrap Metal



When mud pumps are driven from the floor, a unitized fly wheel guard can be constructed and hinged in a convenient manner so that it may be moved with the pump.

Make a belt guard from a convenient width of sheet metal. Fabricate frame in sections as shown.

The center section is hinged at the top so that it may be pulled up out of way while skidding the rig.

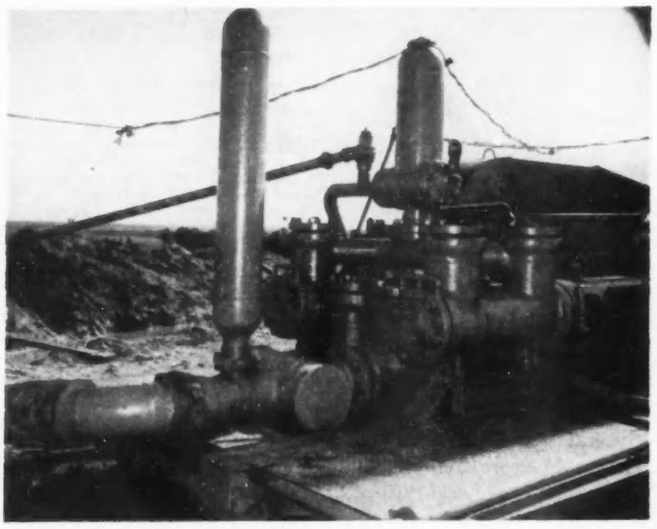
The bottom section wraps around the driven pulleys and rests on a four-inch angle iron brace. The hinges are welded to four-inch flat iron, bolted to the body of the guard. The angle iron has three-inch slots providing for the free movement of the pump forward or backward, so proper adjustments of the belt may be made.

The top section wraps around the pulley of the drive group on the derrick floor.

Hinges enable the guard to fold up or down in the event the pump should be moved to a higher or lower floor level on future locations.

A perpendicular brace on the back of the pump skid helps to brace the side nearest the pump. This brace also is slotted and hinges to allow adjustments for height and bolt tightening. Heavy wire may be welded to the braces protecting personnel, preventing accidents, during repair. A door for taking off and replacing V-belts is located in the lower section as shown.

Suction Pot Increases Pump Efficiency

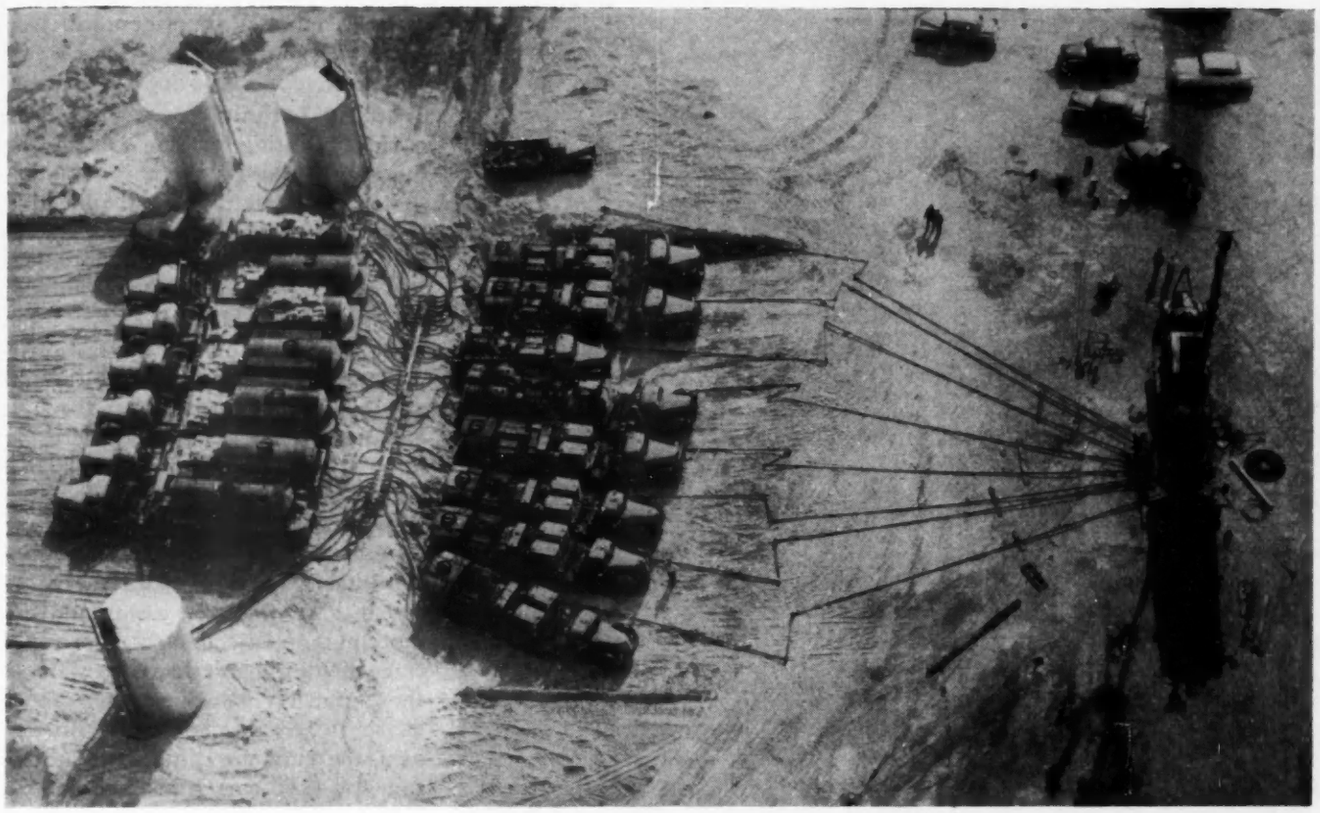


A pot on the suction line will cause mud to feed into the pump better and increase pump efficiency, according to contractors who have used it.

This device has been especially effective when mud is foamy after addition of quebracho or other such chemical agents.

Make the pot from a five-foot length of six-inch pipe with a bull plug welded over the top. Weld a six by three-inch swaged nipple to the bottom. The swage is screwed into a hammer type union, the lower end of which is fastened to the suction line.

Except for dismantling during rig moves, the pot remains on the line and requires no attention. Users claim that when the pump is started up, a vacuum is created inside the pipe and the mud rises and falls inside the pot and creates a steady feed for the pump.



AERIAL VIEW of a typical rapid fracturing operation. Mixing trucks which carry refined oil are spotted behind pump trucks which face well. Suction header separates mixing and pump trucks, with lease oil storage tanks at either end of header.

New Fracturing Idea Tried on Spraberry Wells

Injecting large volumes of sand-laden refined oil at high rates through open casing is latest stimulation method in West Texas. It has possibilities elsewhere.

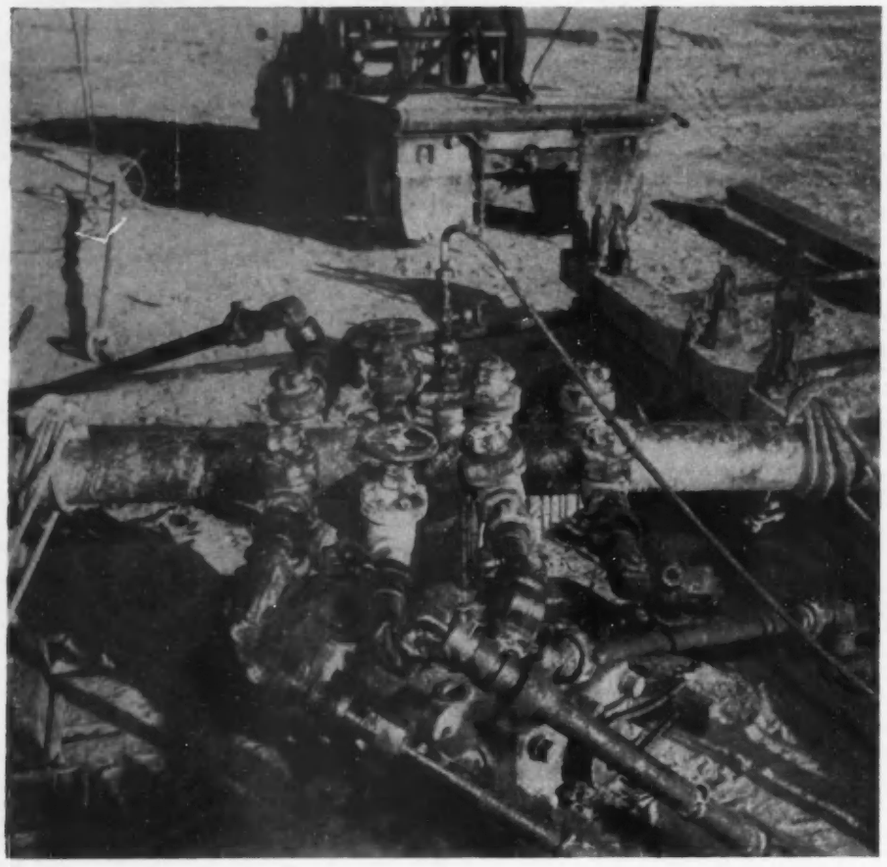
By J. E. KASTROP, WORLD OIL Staff

RAPID FRACTURING tight Spraberry sands by injecting relatively large volumes of refined oil containing from one to 1½ pounds of sand per gallon through open casing at high rates has brought encouragement to operators throughout the Spraberry trend fields. This new fracturing technique was pioneered with considerable success in Southern Oklahoma by the Southern Production Company of Fort Worth, Texas, who first brought the idea to West Texas to be tried on a Spraberry well in June, 1953.

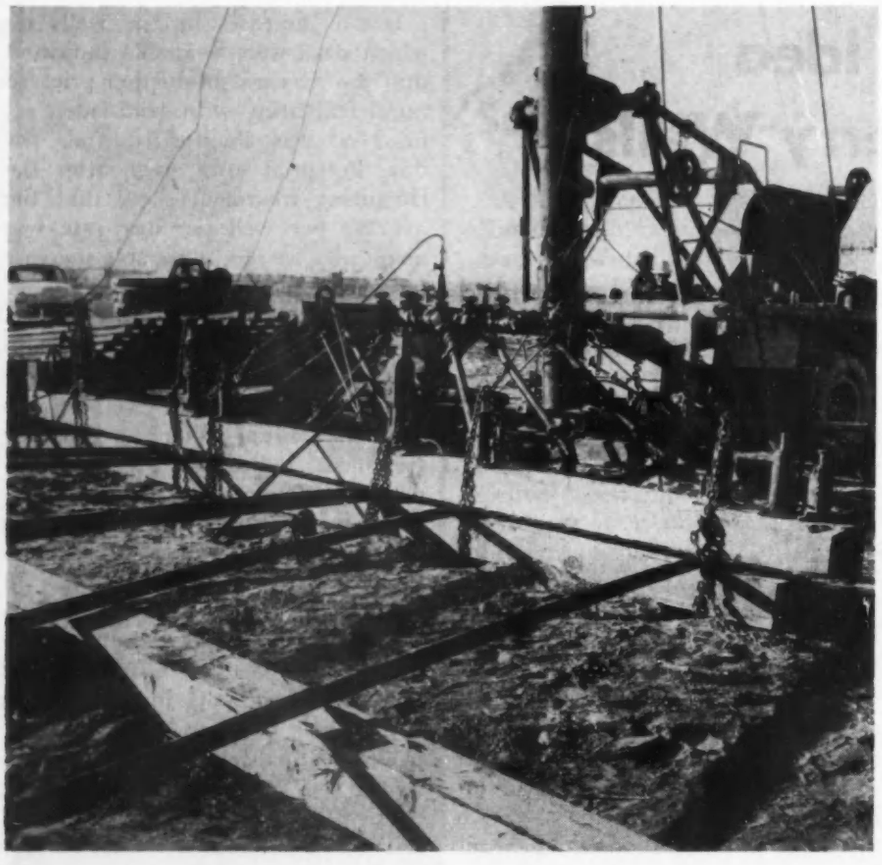
Of 13 wells treated at this writing, early success of 12 wells (initial potential not available on 13th well treated) has created widespread interest in what may be the salvation for many of the disappointing Spraberry producers. Several wells already treated show short payout periods, with payout time varying as the amount of production rate gained and held.

Initial increases in ten wells on which data were available indicated that the average production prior to rapid fracturing with sand-laden refined oil was about 33 barrels per day. Potential tests made after the fracturing treatment show that the average per well per day rate was about 183 barrels, a sizeable increase in over-all averages.

The big question poised by operators now is: will production gains hold up? In a few cases where potentials have been taken several weeks after the initial potential following treatment, indications are that production rates can be expected to decline. However, the declined rate is still considerably above production rates prior to the fracturing job. In two cases of the ten cited, production rates actually climbed slightly over initial potentials taken immediately following treatment. In one case, a bottom-hole pressure bomb measurement prior to rapid fracturing with refined oil and sand leveled off at about 1470 pounds per square inch after 72 hours in the hole. After treating, a pressure of 1435 psi was reached in only 24 hours, indicating a sub-



INJECTION MANIFOLD flanged to blowout preventer on well head. Each two-inch line connects to the discharge on pump trucks. Hose at top carries casing pressure to recording pressure chart.



SANDWICH BOARDS clamped together hold two-inch discharge lines to dampen much of the pulsation during high rate of injection. Bottom timber is anchored to two deadmen.

stantial increase in permeability around the bore hole.

Treating Technique. Success of the rapid fracturing method lies in the injection of large volumes of treating materials at relatively high injection rates. Heretofore, practice in fracturing West Texas wells was to inject the treating materials down tubing. Because of the high viscosity of the sand-laden treating fluids, it was difficult to exceed an injection rate of about 10 barrels per minute through 2½-inch tubing. This new fracturing idea utilizes from 18,000 to 30,000 gallons of refined oil in which is suspended from one to 1½ pounds of Ottawa sand per gallon. To increase injection rates, it was necessary to pump down the open casing and use more pumps. Injection rates for rapid fracture treatments made to date in the Spraberry have averaged about 40 to 45 barrels per minute. In one well, the maximum injection rate attained was 66 barrels per minute.

Formation oil taken from lease stock tanks is normally used to fill the casing and to establish injection rates prior to pumping in the fracturing materials. Lease oil is also used to "chase" or "flush" the fracturing fluids into the formation. In most wells treated thus far, from 300 to 400 barrels of flush oil are pumped into the formation behind the treating fluids.

Sand used in these rapid fracturing treatments is the same Ottawa sand used in other fracturing processes. It is a round grained sand, having a permeability of about 105 Darcys. Sieve size is 20 to 40 mesh.

The most succesful carrying oil to date has been refined paraffin-base crude. At 122 degrees Fahrenheit, it has a viscosity of 250 to 400 Saybolt Furol Seconds, a pour point of 65° F. and a flash point of 380° F. Gravity before blending is from 7 to 11 degrees API. Sand settling rate of the refined oil at 90° F. is three feet per minute; at 110° F., 5 feet per minute; and at 130° F., 8 feet per minute. It is readily soluble in crude oil and is capable of absorbing large volumes of free gas when spread through the formation. When carrying sand into the formation, this refined oil loses its viscosity due to mixing with formation oil, and returns to the well bore as a thin fluid. Gravity of the produced mixture following treatment

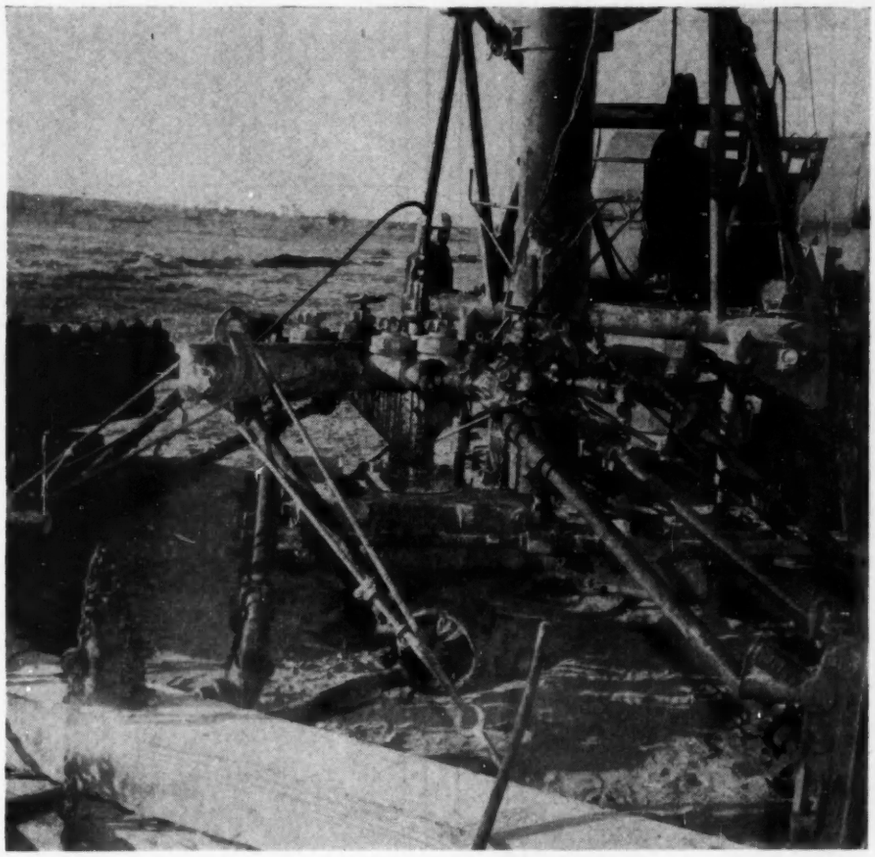
will be lower than the gravity of formation oil, but the gravity of produced oil quickly climbs back to normal values.

Preparation of Well. Majority of rapid fracturing treatments to date have been performed through the open hole, although several wells have been treated through perforated liners set in the open hole. If the well is flowing, it is killed with dead oil taken from lease stock tanks. Tubing is pulled and a manually-operated blowout preventer flanged to the tubing head. An injection manifold is connected on top of the blowout preventer. This manifold is made from 7-inch N-80 casing and contains eight 2-inch outlets equipped with shut-off valves.

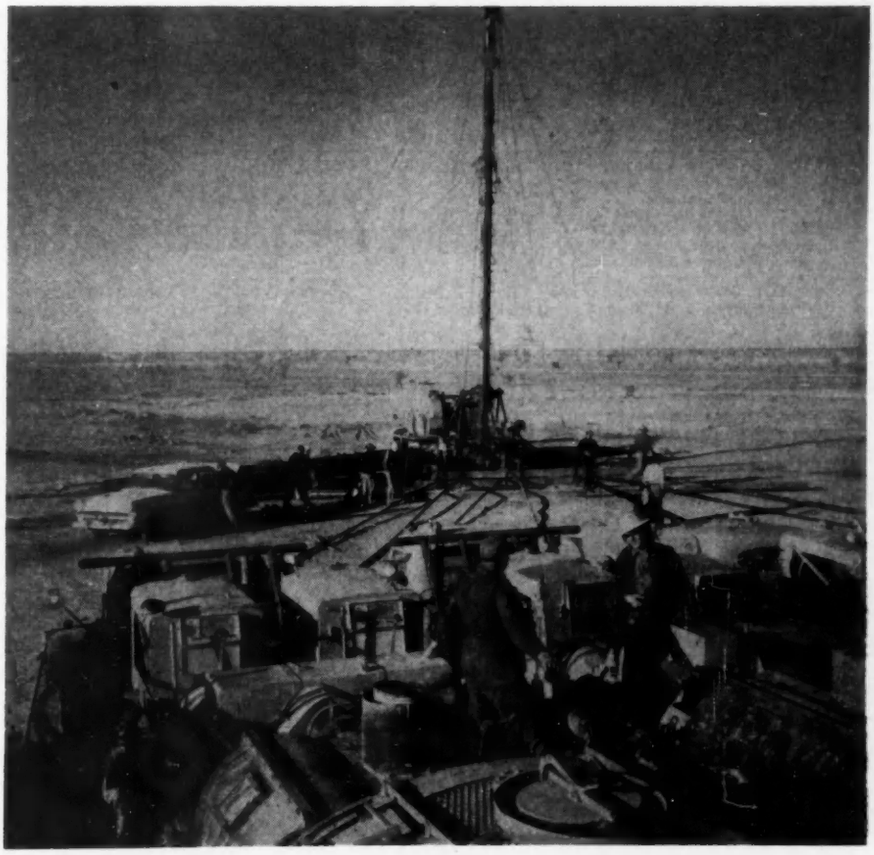
Because the flow lines carrying oil and treating materials to the injection manifold pulsate when pumping at high rates, it was necessary to anchor the manifold securely. Four "dead men" were set around the well at 12-foot centers with the well at the center, and wire rope used to hold the manifold in place. Turnbuckles took up slack in these lines so that a rigid installation was made. A schematic diagram of the well and injection assembly is shown in Figure 1.

Surface Hookup. In order to provide the necessary pump volumes and pressures for rapid fracture treatments, as many as eight pump trucks are used. During injection, each pump averages little more than five barrels per minute. Two-inch flow lines (one operator uses 2½-inch lines) tie the discharge of each pump to one of the eight connections on the injection manifold. Two joints of tubing are normally used to make this connection since it is desirable to spot the pump trucks a safe distance from the well. Quick-make unions and swing joints facilitate hooking up these flow lines from pumps to injection manifold.

To further snub pulsations of the discharge lines leading from pumps to the injection manifold, two 40-foot lengths of 12- by 12-inch timber are used. One piece is laid on the ground across the two front deadmen which hold down the injection manifold. Discharge lines are laid across this piece, and the second 40-foot piece placed on top of the discharge lines. The two timbers are placed one above the other, and by means of chains and



FOUR DEADMEN hold down injection manifold with wire rope to minimize vibration of well head during injection. Sandwich boards are in foreground.



PUMP TRUCK OPERATORS have full view of well and hookup. Service company supervisor directs and co-ordinates all pumping operations from the well.

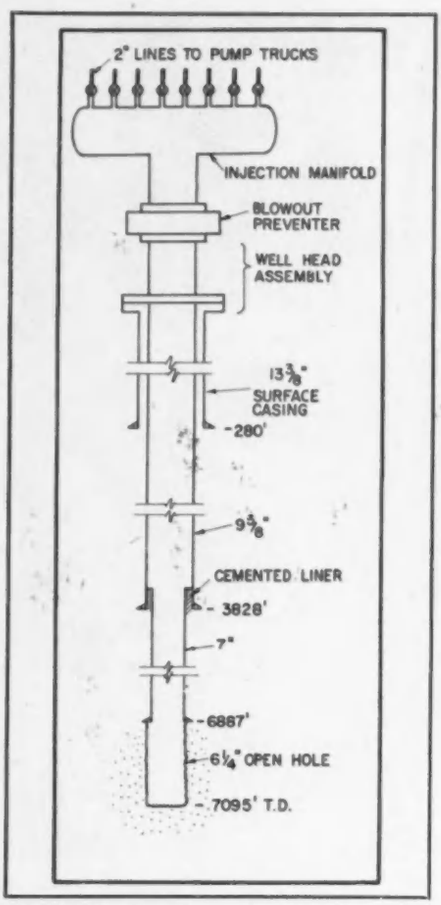


Fig. 1—Cross-section of well and surface hookup for rapid fracturing treatment.

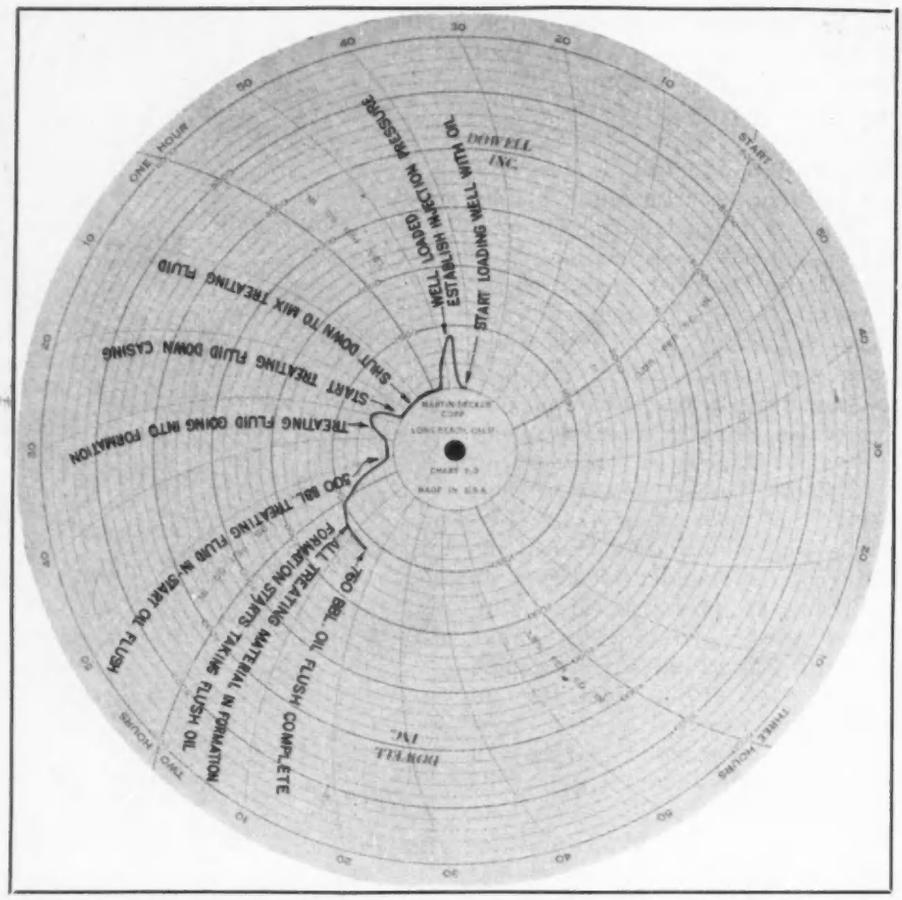

DOWELL INC.
START LOADING WELL WITH OIL
ESTABLISH INJECTION PRESSURE
SHUT DOWN TO MIX TREATING FLUID
START TREATING FLUID DOWN CASING
TREATING FLUID GOING INTO FORMATION
500 BBL TREATING FLUID IN-START OIL FLUSH
ALL TREATING MATERIAL IN FORMATION STARTS TAKING FLUSH OIL
750 BBL. OIL FLUSH COMPLETE
ONE HOUR
TWO HOURS
THREE HOURS
START

Fig. 2—Recording pressure chart tells story of a complete rapid fracturing job. Pressure indicated is that of the injection manifold.

Summary Data Sheet on Spraberry

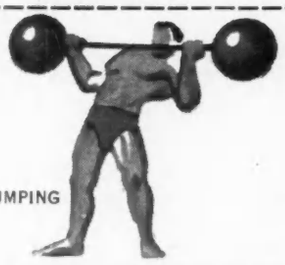
Rapid Fracturing Treatments (To 12-10-53)

Well	Initial Completion Data	Initial Potential	Cumulative Production Prior to Treatment	Potential Prior To Treatment	Workover Data	Average Injection Rate	Latest Potential Test
A	12-7-51, Open Hole, 7212-7420, Uncemented, 7-inch liner. Treated w/ 3000 gal., 1500 lb. sand.	Flowed 215 BOPD, GOR: 637	23,172	Pumped 18 BOPD, 14% water, GOR: 1800.	6-15-53, w/20,000 gals. 1½ lb. sand. Max. Press.: 750. Min. Press.: 240.	18 BPM	Flowed 71 BOPD, 12% water.
B	1-17-52, 7108-7220 and 6992-7077. Uncemented 7-inch liner. 1000 gal. flush, 4000 gals. w/2000 lb. sand.	Flowed 286 BOPD, GOR: 946	29,172	Pumped 4 BOPD, GOR: 3500.	9-5-53 w/20,000 gals. 1½ lb./gal. sand. Max. Press.: 1050 Min. Press.; 700 psi.	28 BPM	Flowed 171 BOPD, GOR: 850.
C	3-15-53, 7210-7408, uncemented, 7-inch liner, 4500 gals. w/2250 lb. sand.	Flowed 78 BOPD, 5% water, GOR: 651	17,638	Pumped 14 BOPD, 22% water, GOR: 3000.	10-7-53 w/20,000 gals. 1½ lb. sand/gal. Max. Press.: 1000. Min. Press.: 600.	30 BPM	Flowed 183 BOPD, 18% water. GOR: 1190.
D	1-15-52, 7253-7484, Uncemented 7-inch liner; 4500 gals. 2250 lb. sand.	Flowed 399 BOPD GOR: 217	38,299	Swabbed 13 BOPD, 20% water, GOR: 650.	10-29-52 w/21,000 gals. 1½ lb. sand/gal. Max. Press.: 900. Min. Press.: 600	29 BPM	Repairing Liner, No Test Made.
E	2-1-52, 6147-7400, Uncemented 7-inch liner. 4500 gals., 2250 lb. sand.	Flowed 332 BOPD, GOR: 558	19,675	Pumped 8 BOPD, 12% water, GOR: 2000.	11-8-53 w/21,000 gals. 1½ lb. sand/gal. Max. Press.: 1100. Min. Press.: 600.	45 BPM	Swabbed 133 BOPD, 35% water.
F	11-2-52, 6946-7200, Uncemented 5½-inch liner. 4500 gals. 2250 lb. sand.	Flowed 212 BOPD, GOR: 1174	19,632	Flowed 33 BOPD, 4% water.	11-15-53 w/21,000 gals. 1½ lb. sand/gal. Max. Press.: 1050. Min. Press.: 1200	26 BPM	Flowed 240 BOPD, GOR: 1567.
G	12-9-52, 7203-7456, Uncemented 7-inch liner. 4500 gals. 2250 lb. sand.	Flowed 462 BOPD, GOR: 731	40,230	Flowed 65 BOPD, 10% water.	11-25-53 w/21,000 gals. 1½ lb. sand/gal. Max. Press.: 1050. Min. Press.: 650.	40 BPM	Flowed 355 BOPD, 3% water.
H	1-4-52, 7190-7460, Uncemented 7-inch liner. 4500 gals. 2250 lb. sand.	Flowed 571 BOPD, GOR: 779	39,175	Flowed 60 BOPD, 8% water.	11-19-53 w/21,000 gals. 1½ lb. sand/gal. Max. Press.: 1100. Min. Press.: 650.	38 BPM.	Flowed 152 BOPD, GOR: 920.
I	3-5-52, 7135-7404, Uncemented 7-inch liner. 4500 gals. 2250 lb. sand.	Flowed 125 BOPD, GOR: 321	30,000	Pumped 15 BOPD, 17% water.	11-30-53 w/30.000 gals. 1½ lb. sand/gal. Max. Press.: 925. Min. Press.: 500.	40 BPM	No Test To Date.
J	7-21-52, Open Hole, 7440-7655, 4000 gals. 2000 lb. sand.	16 BOPD, GOR: 540	10,182	Pumped 13 BOPD, GOR: 560.	11-11-53 w/12,000 gals. 1 lb. sand/gal., Max. Press.: 1200, Min. Press.: 1050. Second Stage: same as first, Max. Press.: 1300. Min. Press.: 1000.	33 BPM (1st Stage) 33 BPM (2nd Stage)	Flowed 155 BOPD, 14% water. GOR: 1100.
K	12-22-51, 6398-6670, Uncemented 7-inch liner, 500 gals mud acid, 3000 gals. 1500 lb. sand.	Flowed 304 BOPD, 2.6% water, GOR: 536	24,347	Flowed 30 BOPD, 0.6% water, GOR: 3050.	11-17-53 w/21,000 gals. 1½ lb. sand/gal. Max. Press.: 1025. Min. Press.: 175.	31 BPM	Flowed 283 BOPD, 20% water.
L	2-24-53, 6800-6910, Uncemented 5½-inch liner. 3000 gals., 1500 lb. sand.	Flowed 82 BOPD, 2.5% water, GOR: 366	1,623	Flowed 83 BOPD, 2% water, GOR: 682.	11-28-53 w/21,000 gals. 1½ lb. sand/gal. Max. Press.: 1650. Min. Press.: 900.	30 BPM	Flowed 130 BOPD, 4 BWPD, GOR: GOR: 5781.
M	2-25-52, Open Hole, 6887-7095, 6000 gals. 3000 lb. sand.	Flowed 336 BOPD, No water, GOR: 615	12,954	Flowed 22 BOPD, GOR: 4750.	12-10-53 w/18,000 gals. 1½ lb. sand/gal. Max. Press.: 750. Min. Press.: 400.	38 BPM	Well Being Swabbed.

WHAT IS YOUR WELL CONDITION?

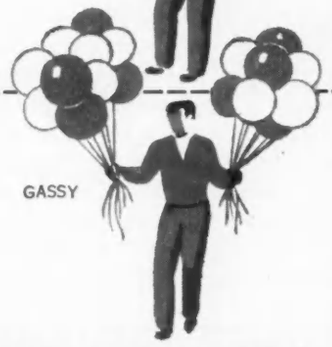
CORROSIVE

ABRASIVE


HEAVY PUMPING

HEAVY IMPACT

EASY PUMPING


GASSY

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Check the information below and realize that Axelson provides the right combination of **matched** seat-and-ball for every pumping condition. As with all Axelson products, this vital pump part is the finest obtainable. Axelson seat-and-ball quality is your best insurance against costly production failures. Each micro-finished ball has mechanically perfect mating with each of the two precision ground surfaces of the seat. Hence, seat-and-ball becomes a matched pair, vacuum tested as a pair and packaged as a pair.

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jacks are fastened securely together and are anchored to the deadmen. The discharge lines are "squeezed" or "sandwiched" between the two pieces of timber. Two such sandwich boards are used in some cases in order to minimize vibration of connections on the injection manifold.

Suction of each pump connects to a source of lease oil and to a supply of treating fluid. In the 13 wells treated to date, there are two general ways of accomplishing the suction hookups. One method utilizes a suction header measuring 80 feet long and made of 8⅝-inch lapwelded pipe. Each pump suction connects to this header through a three-inch flexible rubber hose.

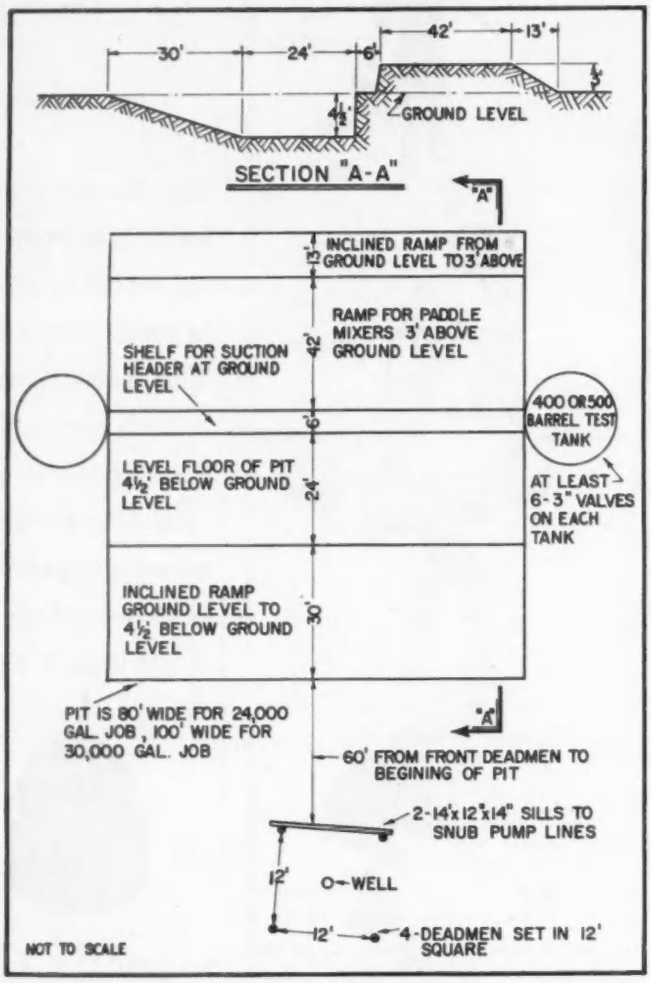


Fig. 3—Plans for preparation of location for pump and mixing trucks to gain suction head of about seven and one-half feet.

Treating fluid is supplied this header by mixing trucks which carry refined oil in required volumes to the well site. Each mixing truck has a capacity of 3000 gallons. Just prior to injecting the treating fluid, Ottawa sand is poured in the mixing tanks which are equipped with paddles that rotate to keep the sand thoroughly mixed. Each mixing truck connects to the suction header through three-inch flexible hose which carries the oil and sand mixture by gravity to the header.

Lease oil for filling the casing and for flushing the treating fluid into the formation is stored in portable 250-barrel welded tanks. At the bottom of each tank are six 3-inch connections fitted with valves. These connections tie into the header with 3-inch rubber hose. Two or three of these tanks may be used. However, it has been necessary to supplement this volume of oil with oil brought to the location in tank transports. During injection, these transports pump into the storage tanks in order to maintain as high a suction head as possible by keeping the tanks filled.

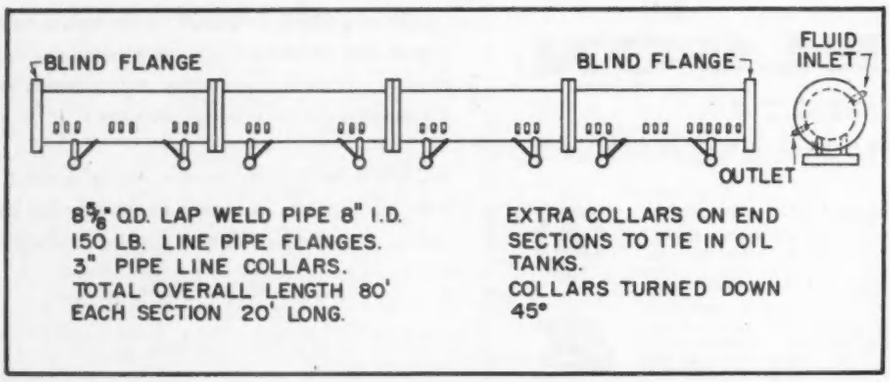

BLIND FLANGE
BLIND FLANGE
FLUID INLET
OUTLET
8⅝" O.D. LAP WELD PIPE 8" I.D.
150 LB. LINE PIPE FLANGES.
3" PIPE LINE COLLARS.
TOTAL OVERALL LENGTH 80'
EACH SECTION 20' LONG.
EXTRA COLLARS ON END SECTIONS TO TIE IN OIL TANKS.
COLLARS TURNED DOWN 45°

Fig. 4—This 80-foot long suction header facilitates hooking up all the suction lines which must feed both lease oil and treating mixtures to eight pump trucks.

Pump Suction Header. Use of a suction header simplifies treating operations by making it possible to switch from lease oil in the storage tanks to mixing truck and back to the storage tanks without interrupting flow into the well. This header is made up in 20-foot sections as shown in Figure 2. Each section is flanged to the other, with the ends blanked off with blind flanges. Both inlet and outlet connections are 3-inch nipples which couple to flexible rubber hoses that tie into the storage tanks and to mixing trucks. To minimize settling of sand in the header, the outlet connection points downward and the inlet upward as shown in the cross-section view.

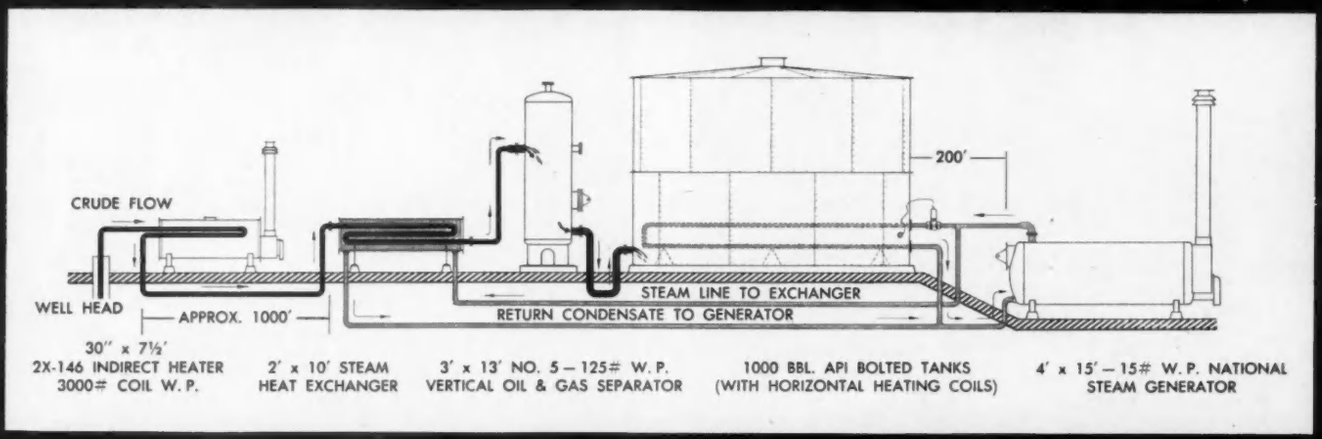
Increasing Suction Head. Maximum pumping efficiency was gained by creating a suction head on the pumps. This was done by setting the storage tanks on 6-foot substructures, placing the mixing trucks on earthern mounds and spotting the pump trucks in a wide sloping pit. Figure 3 illustrates schematically how the location was prepared prior to spotting equipment. A gain in suction head of 7½ feet was made by digging the pit 4½ feet below ground level and building up a mound behind it about three feet above ground level. A six-foot wide shelf separating the pit from the mound provided ample space in which to set the suction header.

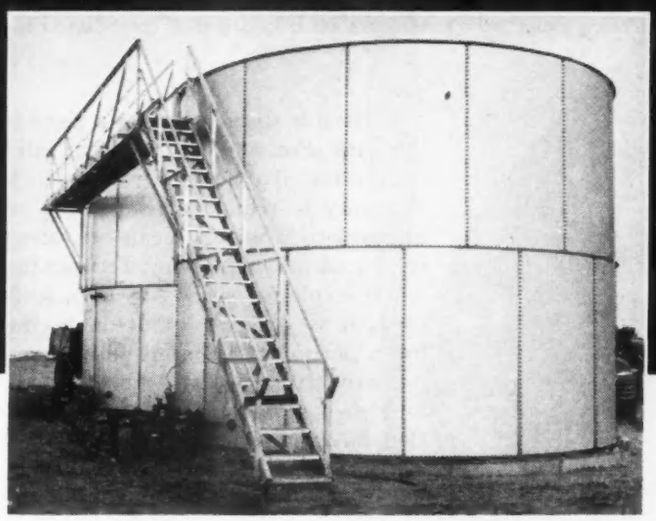
Another Hookup Method. Another method of hooking up the suction lines into the pump trucks employs mud tanks which serve as sump tanks for handling lease oil. In this case, the pumps take lease oil from the sump for flushing the treating material into the formation. Suction hoses must be laid to the mixing trucks which supply the mixture of refined oil and sand. On one recent job hooked up in this manner, two 225-barrel mud tanks were used as sump tanks. Lease oil was hauled to the location in tank transports which pumped into the oil sump during the time when flush oil

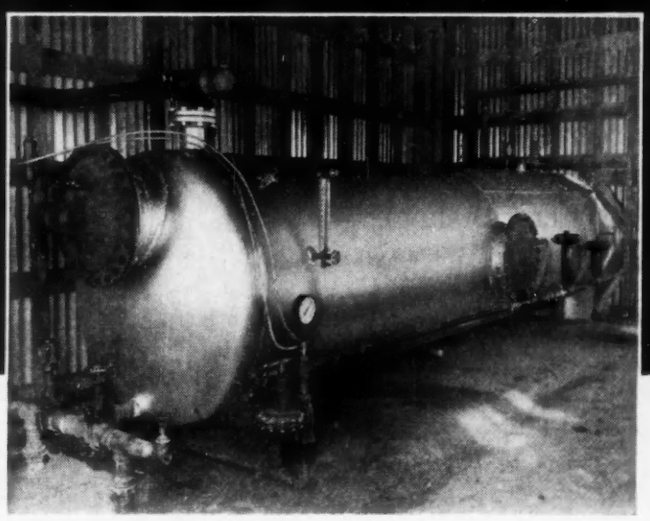
Continued on Page 167

PRODUCTION PROBLEM SOLVED IN UINTAH COUNTY NEAR VERNAL, UTAH

Problem — To handle 240 barrels per day of 37-degree gravity oil with a pour point of 90-degrees.







Solution — National Tank Company equipment is set as per the above flow diagram. An indirect heater is set at each well head for a flow line heater in order to keep production at a high enough temperature to prevent congealing in the lines. Before separation, the production is subjected to an additional heat through a Steam Heat Exchanger so that gas can properly be separated from the oil in the oil and gas separator. Each tank is thermostatically controlled at a temperature of 110° preparatory to being shipped by truck as there is no pipeline connection available at present time. A 4' x 15' two million BTU 15# W. P. National Steam Generator is installed along with coils in each tank to keep the production to 110-degrees in the stock tanks. This is a closed system with the generator set at a lower level than the tank grades and the condensate line buried from the tanks back to the unit. Atmospheric temperatures in this area range sometimes as low as 40° below zero in the winter months.

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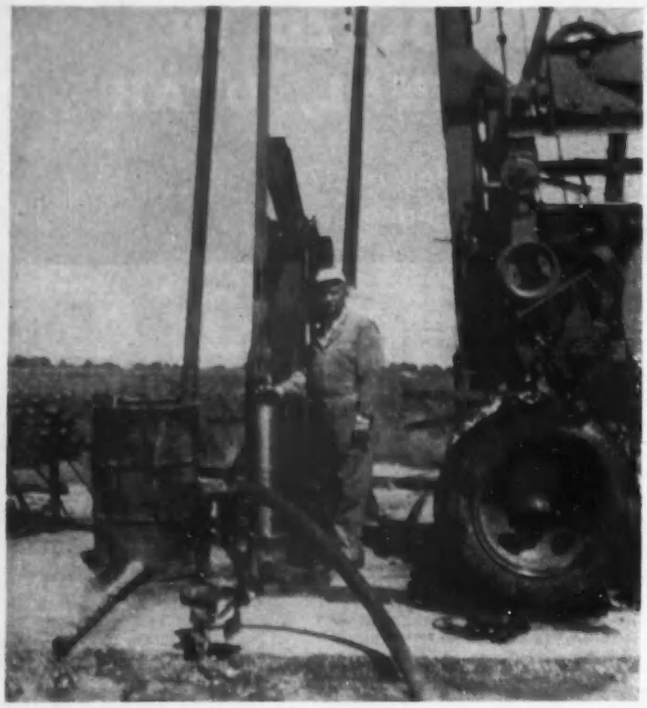
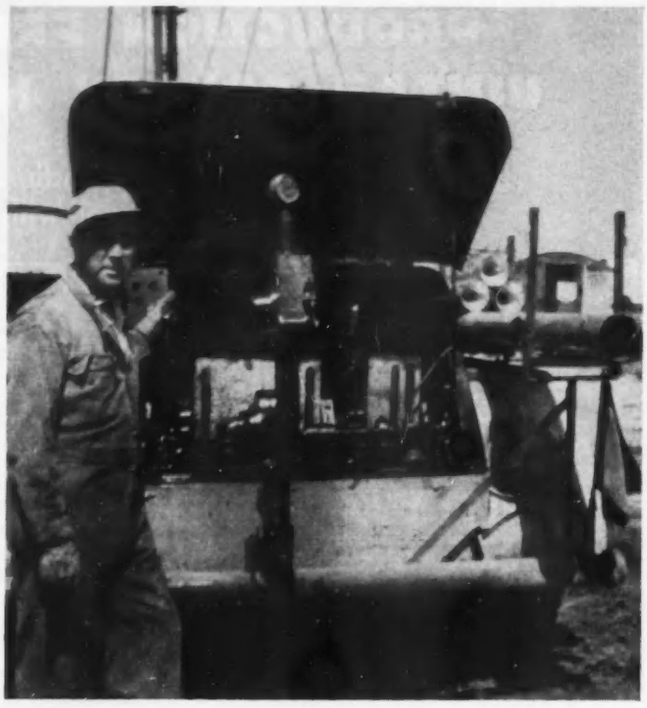
TULSA, OKLAHOMA





SHOOTING WATER INPUT WELLS. At the left is shell filled with explosive and ready to be lowered into well. Right is rear view of shooting truck showing measuring device and wire line tension gauge, which indicates when loaded shell comes into contact with fluid.

- **Where to shoot?**
- **How much shot?**
- **How to tamp?**
- **Some questions and answers on . . .**

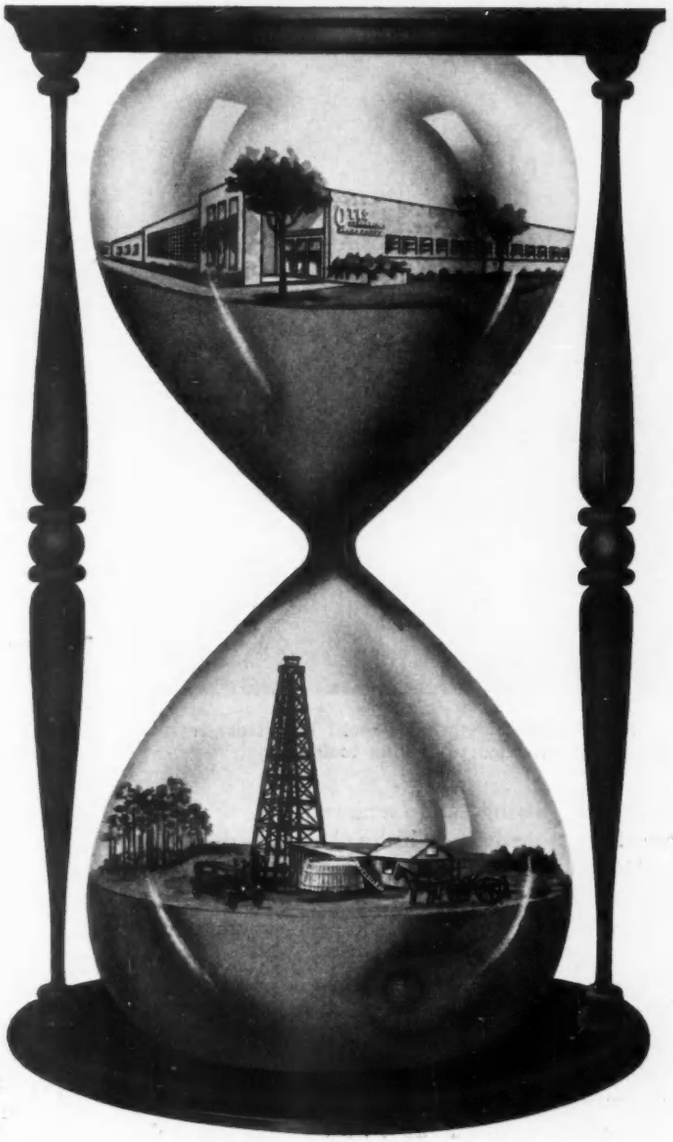
Shooting Water Input Wells

By G. C. (SHORTY) ROBERTS,
Independent Eastern Torpedo Company, St. Elmo, Ill.

DEVELOPMENTS IN explosives and equipment, coupled with a better understanding of well conditions, have brought about more effective practices in shooting water input wells. Among these new techniques is that of selective shooting. Logs, cores and formation samples provide information needed to place the shot where it will be most effective. Rather than shoot the entire formation from top to bottom as was the former practice, particular attention is now given to fitting the explosive charge to the formation characteristics of an individual well. Shale breaks or streaks of barren strata are now considered in planning a shooting job. Results of these studies prior to shooting, and designing the shot to meet well conditions have increased water input rates.

Numerous types of explosives are available for shooting wells. Some types enable shorter clean-out periods after the shot, and others permit safer operations. To achieve safety, it is necessary to reduce the sensitivity of an explosive, which means reducing its speed of explosion. Frequently, where explosive speed has been lowered, it is difficult to detonate the lower portion of a charge. This is particularly true when the shot is run in long shell sections. Speeds of detonation have been reduced by as much as 65 percent. Under these conditions, results from the lower section of the shot may not be good. This lower portion either fails to explode or burns out, resulting in a costly and tedious clean-out job. In some instances, this type of charge has been bailed from the hole after it failed to detonate. In other cases, portions of the charge have exploded after the tools were run back in the hole to endanger lives of men on the rig and to threaten loss of the hole.

Explosive types. Liquid nitroglycerin has proven to be one of the most satisfactory types of explosives in shooting water input wells. Records show that very few accidents have occurred from its use. Speed of detonation is 27,800 feet per second and it is the most powerful explosive used in well shooting. Results of this type explosive are just as apparent at the bottom of the hole as at the top of



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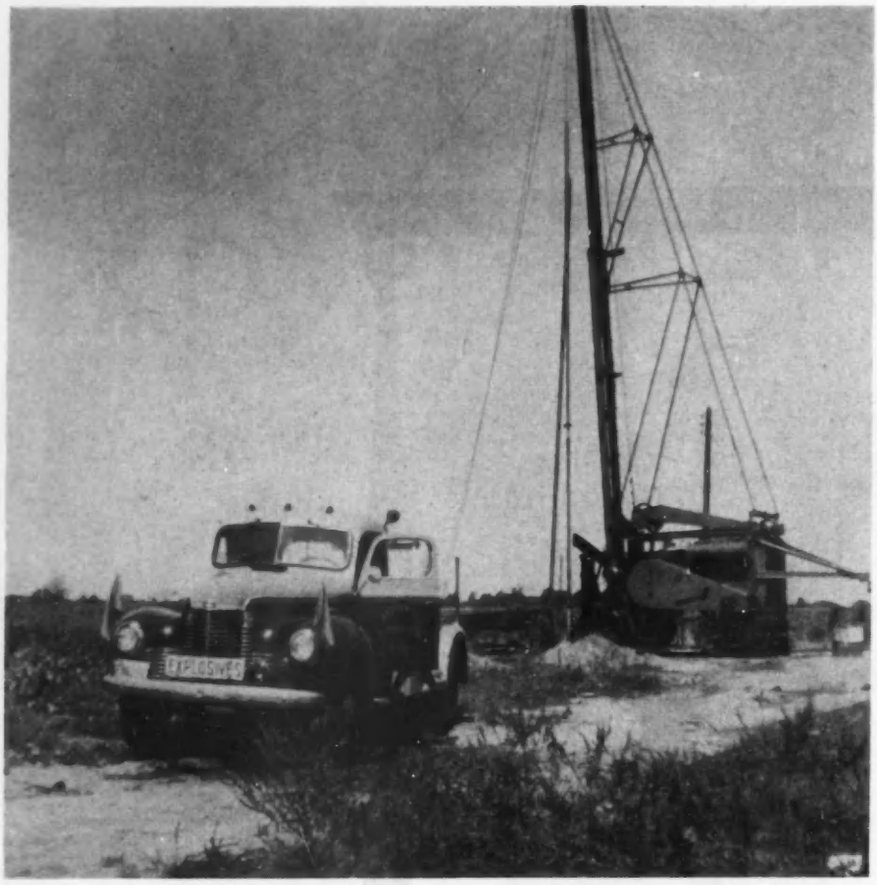


SHOOTING TRUCK in position on well drilled with cable tools. Line from reels are threaded through pulley attached to drilling tools.

the shot, regardless of length or size of shells. It is being used successfully in shells ranging in size from 1½ to 7 inches in diameter.

Effect of this explosive on a formation is that of a rapid jolt during which an explosive wave expands laterally and horizontally into the earth. This action has been proved by checking line wells in different fields. Wells shot with nitroglycerin have shown excellent recovery and have improved injectivity rates of water input wells. A good example of the power and energy of liquid nitroglycerin against the face of a formation is shown by test data on the explosive. One pound of nitroglycerin, when exploded, yields 156.7 cubic feet of gases at a temperature of 6280° F, and develops a force of 2,120,000 pounds at a pressure of 150,050 pounds per square inch. Interval of explosion is brief and dissipation so rapid that the temperature rise in the hole is negligible.

Solidified nitroglycerin is also a good explosive when used in the 100 percent grade. It is used widely in gas fields or where a section of "window" has been set with the casing string and removed by the usual methods. This explosive tends to have more of a slow pushing effect on a formation and has a speed varying from 24,300 feet per second to 8000 feet per second. It is advisable to utilize as large a shell as possible when using this explosive in long sections. Nothing less than a 3½-inch diameter shell should be used in a long column because this explosive shows a considerable variation in speed due to the conditions under which is is exploded. A booster of sufficient nitroglycerin dynamite is necessary to insure detonation throughout the column.

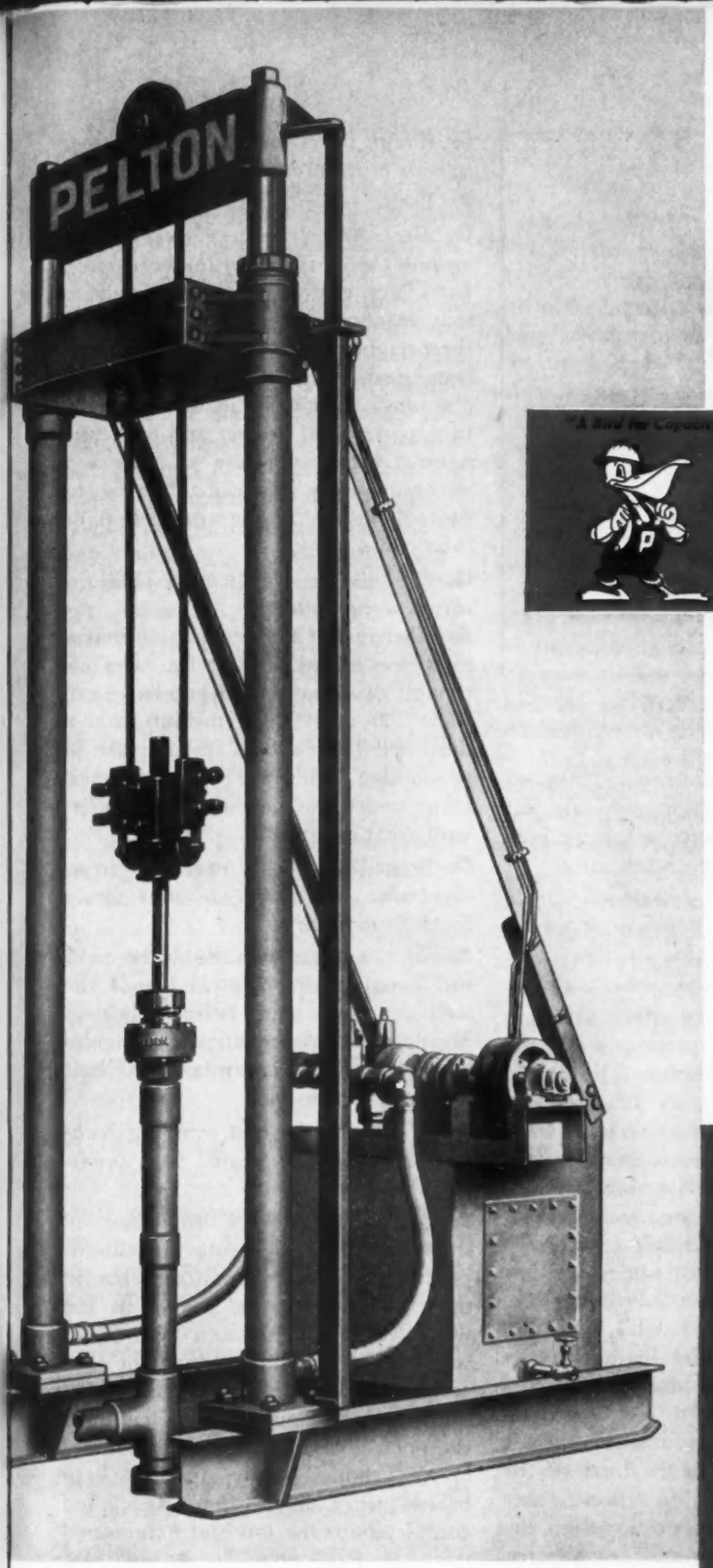
Another type of liquid nitroglycerin which has found successful application in water flood development work is one wherein the pressure per unit volume has been reduced while maintaining a good detonating velocity rate. This results in better formation fracture. Speed of this type of explosive has been developed to exceed 22,000 feet per second, and it carries through to the bottom of a long charge at that speed to give equal results for the entire length of shot. Success of this explosive is attributed to a true nitroglycerin base.

Tamping the shot. Concurrent with the development of new explosives, new and more effective means of stemming or tamping a shot have also been devised. In the early days of shooting, water tamping was about the only method known. It was necessary to set the pipe sufficiently high above the formation in order to protect casing. Not infrequently, this exposed a water-bearing zone which, after the shot, generally resulted in a hole full of water. Procedure in some water-flood areas, and especially those producing from shallow formations, has been to run the electric detonating wire and then pull the casing over the wire. This is not recommended practice since pipe can be damaged and wells ruined, especially where the pipe is bad. There is also the possibility that the wire may be faulty and will not detonate the charge, involving a very dangerous and lengthy clean-out job.

Detonation. A time bomb is probably the most useful device for detonating a charge. Its use enables the operator to cement pipe near the pay formation without damage from the shot. Sand and gravel have been used extensively as a tamp with considerable success. In many operations they are being replaced with a quick setting cement. When this material is used in conjunction with a time bomb, a horizon within three or four feet of the bottom of the pipe can be shot without endangering the casing or casing seat. Very few bad shooting jobs result if a proper gravel bridge is set under the pipe and followed with a slug of quick setting cement. New methods of tamping have greatly benefited water injection wells where casing is set into the top of the formation to be water flooded.

The bomb is placed in a well with a detonating period of not less than one hour. (It can be set for as high as 114 hours). Principal advantage of the time bomb is that it allows sufficient time for the tamp to set, whether it be gravel, sand or quick-setting cement. Another prime advantage in the use of a time bomb is the safety factor. More positive and accurate firing of the shot is assured and very few failures have been noted.

In very shallow areas, it is still common practice to detonate the shot



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Pioneers in hydraulic pumping equipment for the oil industry.

with jack squibs. These are generally used where a short string of casing is run in the well.

In most of the engineered waterflood operations, careful consideration is given the physical properties of a formation. Samples of the formation are carefully analyzed in the laboratory where porosity, permeability, and oil and water content are measured, and other tests run to determine the floodability of the sand. An analysis such as this permits a determination of the quantity of nitroglycerin per foot of sand for best results. Different methods are used in computing these data, but the objective remains the same: to obtain as nearly as possible a uniform water injection rate by creating uniform permeability throughout the input section.

Some questions most frequently asked in shooting water input wells are:

Q: *How close should the shot be placed to the oil/water and/or gas/oil contact?*

A: When shooting a well for natural production where the water table is known to be close to the producing zone, top of the shot should be as far away from the water table as possible. If initial production is profitable, shooting such a well is not recommended as it may go to water.

Q: *How do you determine what type explosive—liquid or solid—should be used for a particular type sand?*

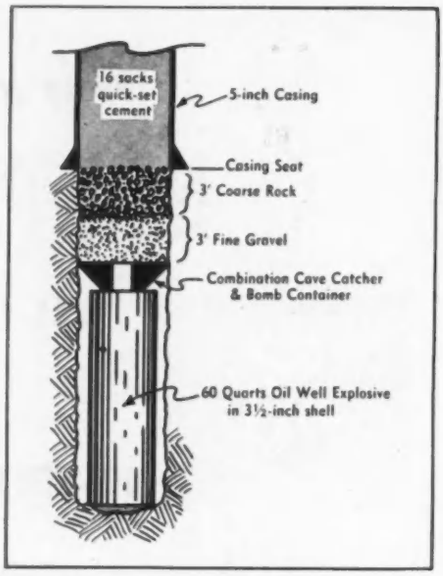
A: This question should be determined by a competent engineer after careful study of formation characteristics and based on experiences gained from shooting other wells in the area.

Q: *Assuming a pocket is developed in the formation after a shot, is this advantageous or otherwise, and why?*

A: Small pockets in a sand formation are a certainty, and the size of a shot naturally controls the size of a shot pocket; the bigger the shot, the larger the hole. It is a distinct advantage to have an enlarged hole in a producing zone, the prime advantages being better drainage area from the vertical and horizontal cracks extended into the formation.

Q: *Is there any depth below which it is unnecessary to shoot a water input well?*

A: No. This would be governed by the water injection rate in said input well and a light or heavy shot is always recommended regardless of depth as a sand body will take off more evenly and have a greater barrel-per-acre recovery when shot.


16 sacks quick-set cement
5-inch Casing
Casing Seat
3' Coarse Rock
3' Fine Gravel
Combination Cave Catcher & Bomb Container
60 Quarts Oil Well Explosive in 3½-inch shell

TYPICAL COMPLETION for shooting water input well. Bomb is set for 23 hours.

Q: *Is it possible to determine from a core analysis or a log which way a formation will fracture, whether vertically or horizontally?*

A: Shot results and effects indicate clearly that an explosion seeks the lines of least resistance. The initial explosion starts out in all directions fracturing the formation in its passage and has more or less a tendency to take an upward inclination. Bottom of a hole is an immovable solid, whereas the material from that point to the surface is not altogether immovable or incompressible. Therefore, when the explosion reaches its maximum intensity at the bottom of the hole it mushrooms and is deflected outward on a more or less horizontal plane, then inclines upward with a diminishing effect as the force of the shot is dissipated. This action is governed on and is proportional to the concentration, magnitude of the explosion and the degree of confinement. It is therefore difficult to determine from core analyses or logs which way a shot will fracture the formation. In some respects this may be fairly well determined. In a soft, permeable sand with high porosity, it is believed the fracture will be in a horizontal direction. In lime formations with good saturation there is reason to expect the same line of travel because of the terrific speeds of the explosives.

Q: *Which is the most effective, a vertical or horizontal fracture?*

A: Both.

Q: *Does the fracture extend all around the periphery of the bore hole?*

A: There is every reason to believe that fractures do extend all around the periphery of a bore hole. This has been proven in water flooding by checking input wells in all directions in a water flood project and by determining barrels-per-acre of recovery which recovery is reasonably close to the calculation at the completion of the flood.

Q: *How far in the formation does a shot fracture extend?*

A: There is no definite way to determine the extent of shot fractures although cases have been known where wells 300 to 400 feet distant from a shot well have shown an increase in production. This has been observed many times proving that fractures extend great distances.

Q: *What "yardsticks" may be used to determine the best type shot for a given formation?*

A: Cores and samples should be carefully analyzed or a good log of the well should be made before shooting. Formation characteristics should also be considered in determining the best type shot for the well.

Q: *What are the best tamping techniques in relation to well bore conditions?*

A: Tamping is very important in shooting, not only from the standpoint of increased production but in the protection of the casing in the well. A fluid tamp is a column of water or oil maintained over the shot to confine the explosion. Quantity of fluid needed depends on the length of the open hole above the shot and size of the shot. Usually, fluid is kept below casing, or else the well is filled completely to the top and maintained there until the shot is exploded. This is a *must* when fluid fills the hole as there is danger of rupturing the casing if the fluid level is allowed to drop even a few feet. A solid tamp is made by setting an umbrella bridge and a time bomb on top of a shot and placing crushed rock or gravel on the bridge, the thickness depending on the remainder of the tamp. If sand is used there should be just enough rock or gravel to open the bridge sufficiently so that all tampering will stay

in place above the bridge and none will pass down to fill in around the shot. This can be checked with a measuring line. Most shots are now tamped with a quick setting gypsum cement run in special bailers. This tamp has been very successful but its success depends on water used in mixing the cement. If an improper fluid is used, setting time is affected and the resultant shot may damage the casing. In this type tamp a 4 or 5-foot gravel or rock bridge should be strong enough to maintain the weight of bailers used. Otherwise, an explosion may result from a collapsing bridge. Advantages of this tamp lie in the fact that it can be readily drilled up after the shot explodes and it has the property of expanding in volume while setting up.

Q: *In selective shooting should the operator consider placement of shot and size of shot?*

A: Both questions should be considered in selective shooting. In shallow production, some operators use a burlap packer set 3 or 4 feet into the top of the formation. Therefore, top of the shot must be placed low enough to leave the packer seat intact. Proper placement and size of shot is very important in water flooding operations.

Q: *Is shooting recommended before formation fracturing?*

A: It seems reasonable that a light shot especially in a hard formation is practical before fracture treatment since it would enable the fracturing agents to penetrate many more sections of the formation than being confined to the softer and more permeable portions. Shots before acidizing have been found very beneficial.

Q: *What important factors should be considered in shooting input wells?*

A: Factors to be considered include: flood pot analyses, permeability, porosity, per-acre recovery expected, type packer set in the well, and primary production before water-flooding. A permeability profile of the well should be made and it, together with old well records carefully studied. An analysis of as much reservoir data as are available will help materially in selecting where to place the shot, size of the shot, and thus assure successful completion of a water input well.

—The End

New Fracturing Idea in West Texas

Continued from Page 158

was being injected into the well. Since both mixing trucks and pump trucks, as well as the lease oil sump tanks, are placed at the same ground level, there is no gain in suction head. Injection rates have not been as high when hooking up pump suctions in this manner as they have been when pits and mounds are made and when a suction header was used.

Rapid Fracturing the Well. Discharge lines and the injection manifold are pressure tested prior to treating. The well is then filled with lease oil and pump pressure applied to the casing until the formation begins to take oil. The maximum pressure reached during this phase of the operation has been termed "establishing injection pressure." In the Spraberry wells treated to date, this pressure has ranged from 750 psi to 1800 psi.

After the injection pressure has been established, pumps are shut down while sand is mixed with the refined oil in the mixing trucks. Suction lines to lease oil supply is shut off, and suction to the mixing tanks opened. The hole is then filled with refined oil containing sand, and all pumps began injecting it into the formation. When the total volume of treating fluid has been pumped into the well, suction lines to the lease oil supply are opened and suction lines to mixing trucks are closed. Pumps continue to operate at high speed to inject the treating fluid as quickly as possible. After all the treating fluid has been injected into the formation, lease oil is continued to be pumped into the well. From 300 to 400 barrels of lease oil are injected into the formation behind the treating fluid to insure placing the treating fluid well into the formation. The amount of lease oil injected into the formation is called "over flush." After the desired volume of flush oil has been pumped into the well, the blowout preventer is closed, pressure bled off the injection lines, and the injection manifold and discharge lines disconnected. If the well is allowed to remain shut in for a short time, pressure in the casing will decline to zero to permit running tubing. Or, the casing pressure may be bled off through the wing valves on the tubing head.

Tubing is run back in the hole and the well swabbed in. Swabbing time varies widely from one well to the next. In the wells thus far treated, swabbing time varies from six hours to seven days. Production tests are made shortly after the well is brought in, and again after one or two weeks.

Significance. What the final significance of this new fracturing technique will be, only time and more workovers of this type will tell. The Spraberry balloon burst almost as quickly as it mushroomed, and most operators view this unusual formation with caution. Some are keeping a close watch on well performance after rapid fracturing, while others find early successes encouraging enough to workover more wells. Undoubtedly there will be so-called failures, but this new fracturing idea is not to be passed over lightly. The next few months may indicate whether or not new wells will be drilled on locations shelved during the decline of the Spraberry in 1951. Hundreds of wells will be excellent prospects for stimulation by this method. What is happening down the hole is a subject about which many pages could be written. Ultimate recoveries from the Spraberry, low as they may be, will not be increased appreciably. The big boon which rapid fracturing may offer Spraberry operators is an economical operation. Increased allowables due to higher well potentials will permit quicker well payouts. Wells now marginal and even deficit wells, could be put on a paying basis.

There is still another possible significance in these successful Spraberry workovers should they sustain increased production rates. The advantage of injecting large volumes at high rates will establish a new technique in fracturing operations. Should it prove successful in the difficult Spraberry sands, possibilities of rapid fracturing could easily extend to hundreds of low potential fields which have the oil-in-place, but just won't produce. Oil men all over the country will be watching closely what happens to rapid fractured wells in the Spraberry, for it could well be another tool to be used to open up locked in oil in similar reservoirs elsewhere.

—The End.

Estimating Gas Reservoir Pressure From Surface Data

. . . . all you need is the depth, gravity of gas and shut-in pressure. Chart on Page 171 tells how.

By LYNN E. FOSTER, Midland, Texas

ESTIMATING THE static sand face pressure in Gulf Coast and Southwest Texas gas wells can be made easily with the aid of the prepared chart on the following page. These estimations assist in the calculation of acceptable static bottom-hole pressures when a pressure bomb is not used. This value, P_f is used in plotting the back-pressure curve ($P_f^2 - P_s^2$ versus Q in MCF per day) used to determine the open flow potential of gas wells.

These calculations of static sand face pressures are required for back-pressure tests on gas wells in Texas. Normally, this calculation is a trial-and-error method where a bottom-hole pressure is assumed and a calculated pressure is arrived at by the procedure outlined in the back-pressure test manual of the Oil and Gas Division of the Railroad Commission of Texas. If the calculated pressure is not within one half of one percent of the assumed pressure, a new value must be assumed. This procedure is followed until the calculated pressure is within the accepted percentage of the assumed pressure. The chart prepared here was designed to eliminate many of the tedious calculations necessary to arrive at a static bottom hole pressure, by providing an assumed pressure more nearly approaching that of the acceptable calculated value.

Construction of Chart. Data used in the construction of the chart were taken from the Texas Railroad Commission files on numerous gas wells that are considered normal, i.e., there was no abnormal pressures or temperatures, and all data were confined to wells located in the Gulf Coast and Southwest Texas. Many test data were available where bottom-hole pressures were recorded by pressure bombs during the back-pressure test. Static and flowing pressures were recorded so that the calculation of the back-pressure test curve was greatly simplified. In the construction of the chart, only back-pressure tests were used where the static and bottom-hole pressures were measured with a bomb. It was essential that the specific gravity of the raw gas be known.

Many tests were eliminated because only separator gas gravity was known. Other tests were discarded as the specific gravity of the raw gas varied widely from the known raw gas gravity within the field. Only such tests were used that all variables required were measured. By knowing the measured value of the static sand face pressure and the shut-in pressure at the well head, the value of e^{ks} could be easily calculated for use in constructing the curves. In each case, average producing depth and specific gravity of the raw gas was known. The straight line curves for different raw gas gravities represents a mean average for that particular gas gravity, and this being the case, values for e^{ks} determined from these curves are purely approximations. However, such approximations are helpful in assuming a static bottom-hole pressure in making the calculations required to determine P_f for use in plotting the back-pressure test curve for any particular gas well.

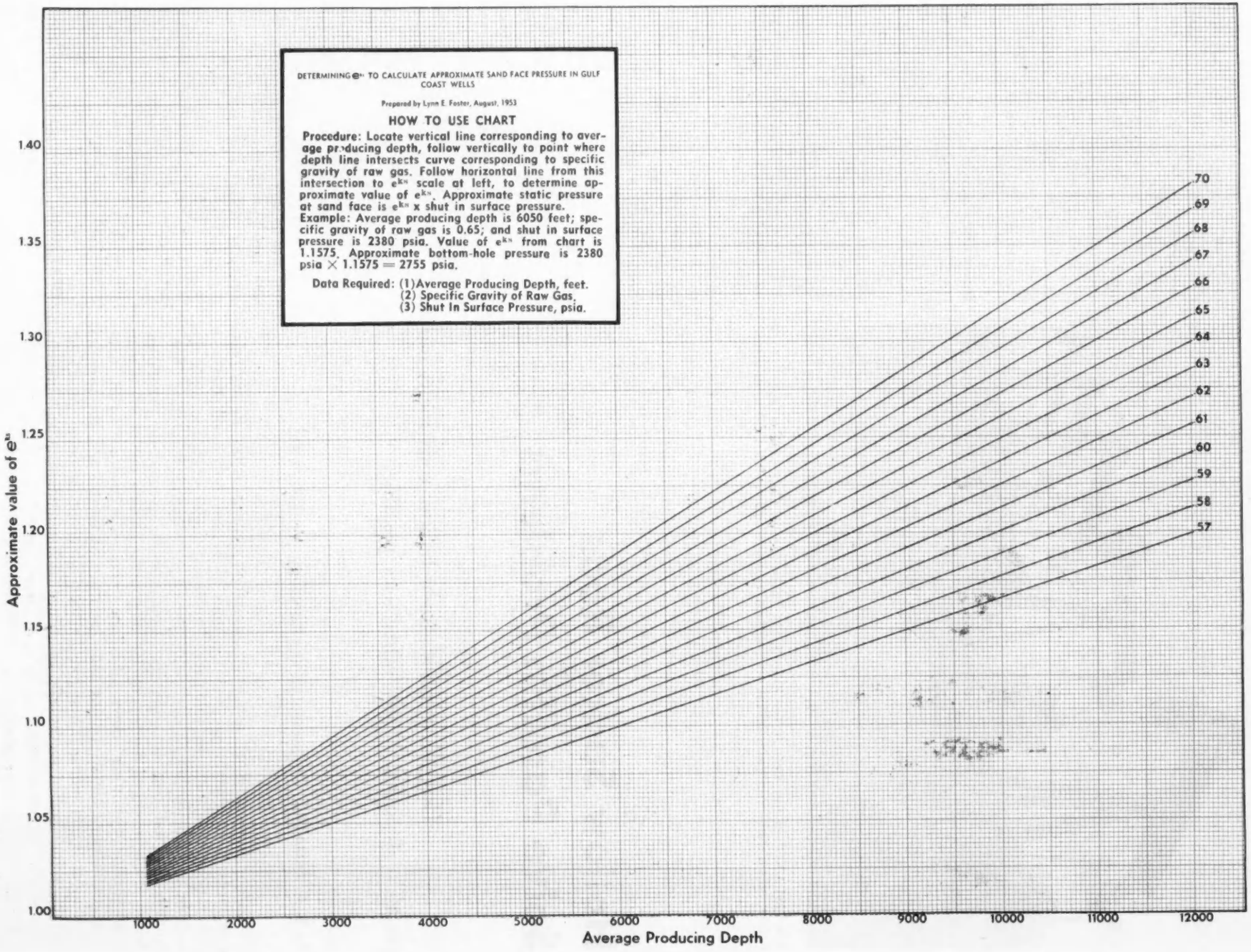
Examples. From the case shown on page 27 of the Back-Pressure Test Manual for Gas Wells issued by the Railroad Commission of Texas, the following data are found: Average producing depth: 6818 feet; shut-in surface pressure: 2221 psia; and specific gravity of raw gas: 0.653. From the chart, value of e^{ks} is 1.188. This value multiplied by the shut-in surface pressure of 2221 pounds per square inch absolute indicates a static sand face pressure of 2638.548 psia. From careful calculations in this example, the value of e^{ks} is 1.188, the same as that taken from the chart, giving a shut-in pressure of 2639 psia.

In another case, the average producing depth was 6050 feet, shut-in pressure was 2380 psia, and the specific gravity of the raw gas was approximately 0.65. Value of e^{ks} taken from the chart is 1.1575, to give an approximate shut-in bottom-hole pressure of 2755 psia. Specific gravity of the raw gas was later found to be 0.657 and the measured bottom-hole pressure was 2695 psia. Error was 60 psia, or 0.022 percent, which is well within the acceptable value for an assumed static sand face pressure in calculating P_f. Of course, examples could be presented to show a wide range of errors when using this method, but the former example is typical of the accuracies to be expected from the chart.

Limitations. When using this method to estimate a static sand face pressure, the following factors must be kept in mind:

- Bottom-hole pressures obtained by this method are only approximate.
- For greatest accuracy, only data from wells in the Gulf Coast and Southwest Texas should be applied.
- The chart is not applicable to gas wells which produce gas of high carbon dioxide content, or wells which are abnormal, that is, abnormal temperatures and pressures.

See Chart on Page 171


DETERMINING e^{ks} TO CALCULATE APPROXIMATE SAND FACE PRESSURE IN GULF COAST WELLS
Prepared by Lynn E. Foster, August, 1953
HOW TO USE CHART
Procedure: Locate vertical line corresponding to average producing depth, follow vertically to point where depth line intersects curve corresponding to specific gravity of raw gas. Follow horizontal line from this intersection to e^{ks} scale at left, to determine approximate value of e^{ks}. Approximate static pressure at sand face is e^{ks} x shut in surface pressure.
Example: Average producing depth is 6050 feet; specific gravity of raw gas is 0.65; and shut in surface pressure is 2380 psia. Value of e^{ks} from chart is 1.1575. Approximate bottom-hole pressure is 2380 psia × 1.1575 = 2755 psia.
Data Required: (1) Average Producing Depth, feet.
(2) Specific Gravity of Raw Gas.
(3) Shut In Surface Pressure, psia.
Approximate value of e^{s}
1.40
1.35
1.30
1.25
1.20
1.15
1.10
1.05
1.00
70
69
68
67
66
65
64
63
62
61
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4000
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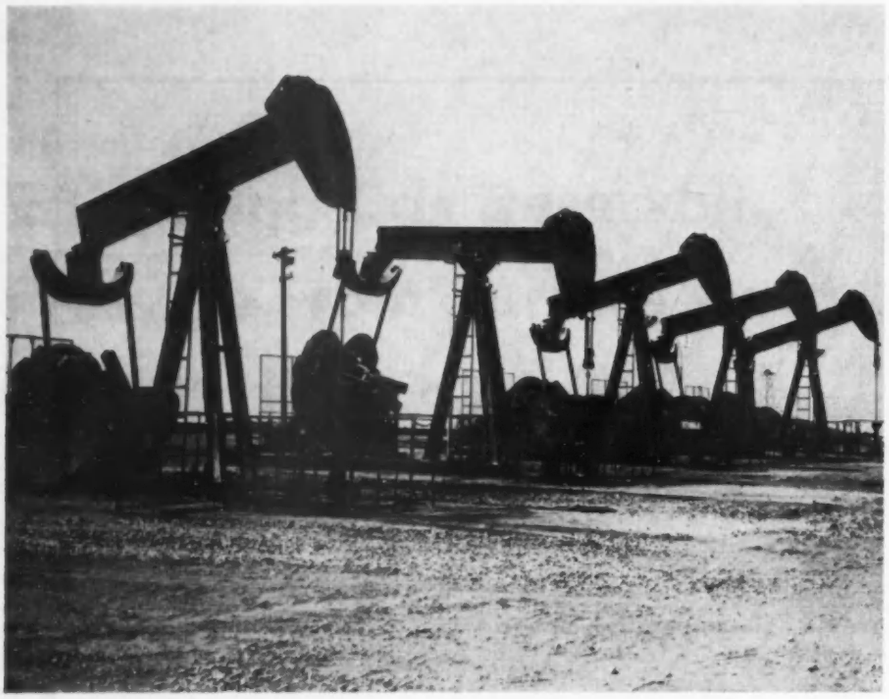
6000
7000
8000
9000
10000
11000
12000
Average Producing Depth



AN "ISLAND" of five wells in the hilly Santa Paula area of California equipped with hollow sucker rods. Wells are drilled directionally and each pump from different zones.

Hollow Sucker Rods Solve Paraffin Problems

Hot oil injected down hollow rods melts out paraffin deposits. Many other uses possible.

By S. A. GILLIARD, Gilliard Specialties Company, Ventura, Calif.

HOLLOW SUCKER RODS are being used successfully to overcome paraffin and tar accumulation in pumping wells by introducing heated oil down through the rod and out into the stream of the produced fluids. This is done without shutting down the pumping unit or manually pulling and stripping rods and tubing. These rods are also being applied successfully in other producing operations.

Paraffin (wax) and asphaltic (tar) accumulations (principally on sucker rods and the inside of tubing) is a constant problem. It becomes increasingly severe and costly during the later producing stages when the wells approach the economic borderline. Other conditions being equal, the percentage of paraffin coming out of solution in the crude oil is governed by the temperature of the oil and the pressure under which it is being produced. Since both temperature and pressure decrease irregularly during the productive life of the reservoir, a field which may have little paraffin trouble during the flush period, generally presents serious difficulties when it reaches the depletion stage.

Some operators wait until the accumulation becomes so thick that rods stick or fail and lead lines are plugged. The pumping unit is then set back and a portable hoist moved in, the rod string pulled and the paraffin layer stripped off, after which rods and tubing are re-run and the well put back on production. On an average 3000-foot well, this operation takes about 16 hours during which the well is off production.

Dewaxing a well. Dewaxing a well equipped with hollow sucker rods using a mobile truck-mounted dewaxing unit is quite simple. The unit is driven to the well and a coupling attached from the discharge line of the truck pump to the flexible injection line coming off the hollow polish rod. A rapid-action heater raises the temperature of the oil to be circulated out of the truck tank to approximately 200° F. The drive for the pump mounted on the truck is then engaged and hot oil forced down the inside of the hollow rod to a point just below the wax. At this point it flows out through ports in a special cross-over check valve to communicate and mix with the produced fluid coming up inside the tubing, and out the well through the regular production line along with the crude oil being pumped. Heated oil melts the wax deposits off both the inside of the tubing and the outside of the rods as it flows up the annulus, forcing the wax back in solution and carrying it out of the hole.

Sufficient residual heat usually remains to effectively melt any small amount of wax that may have formed on the inside of the production line and this is also carried along to the flow tank. In severe cases it may be necessary to first unplug the production lines, in which case the hot oil is first run directly through the pipe line to the tank farm, cleaning the production line. Then the tubing and rods in the well are cleaned as the second and final step.

Other uses. Hollow sucker rods have found applications other than the removal of wax depositions. Some of these include its use in the injection of a viscosity reducing chemical to

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2 *EASY RELEASE IN CASE OF SANDED-UP PUMP*

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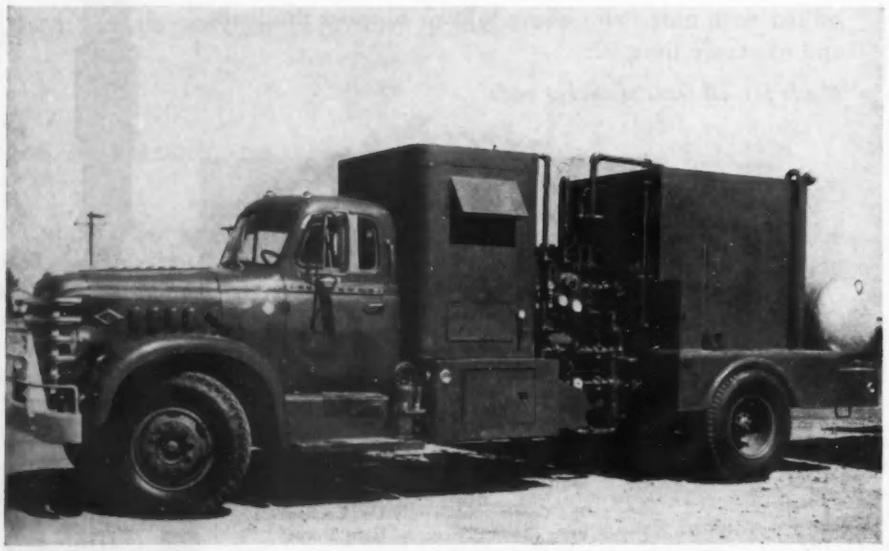
CLOSEUP OF WELLHEAD on well equipped with hollow sucker rods used for circulating hot oil down the string to melt paraffin.

HOLLOW SUCKER RODS on pumping well where it was necessary to inject a chemical corrosion inhibitor down the string.

"thin out" low gravity crudes, which has proved both economical and efficient in that just the right quantity of thinning agent can be introduced at the right point to bring the oil out exactly at the desired gravity. It has also been used to inject water or other fluids which, by washing and agitation, have freed bottom-hole pumps from sand. The rod has been used for acidizing; to inject demulsifying agents to cut the cost of dehydration; and to inject corrosion inhibiting agents.

One of the most recent and novel uses to which the rod has been put concerns its application in dual completions. Some wells that are brought in to produce from dual zones now use the hollow sucker rod to produce the lower zone while the upper zone is produced by gas lift through the annulus between the tubing and casing. Down-hole packers are used between the tubing and casing to prevent communication between zones, and a packer may be used on the bottom of the tubing through which the hollow rod is run. This latter packer may be eliminated provided gas is being injected continuously down the tubing and if the lower zone can tolerate the additional back pressure of such injection.

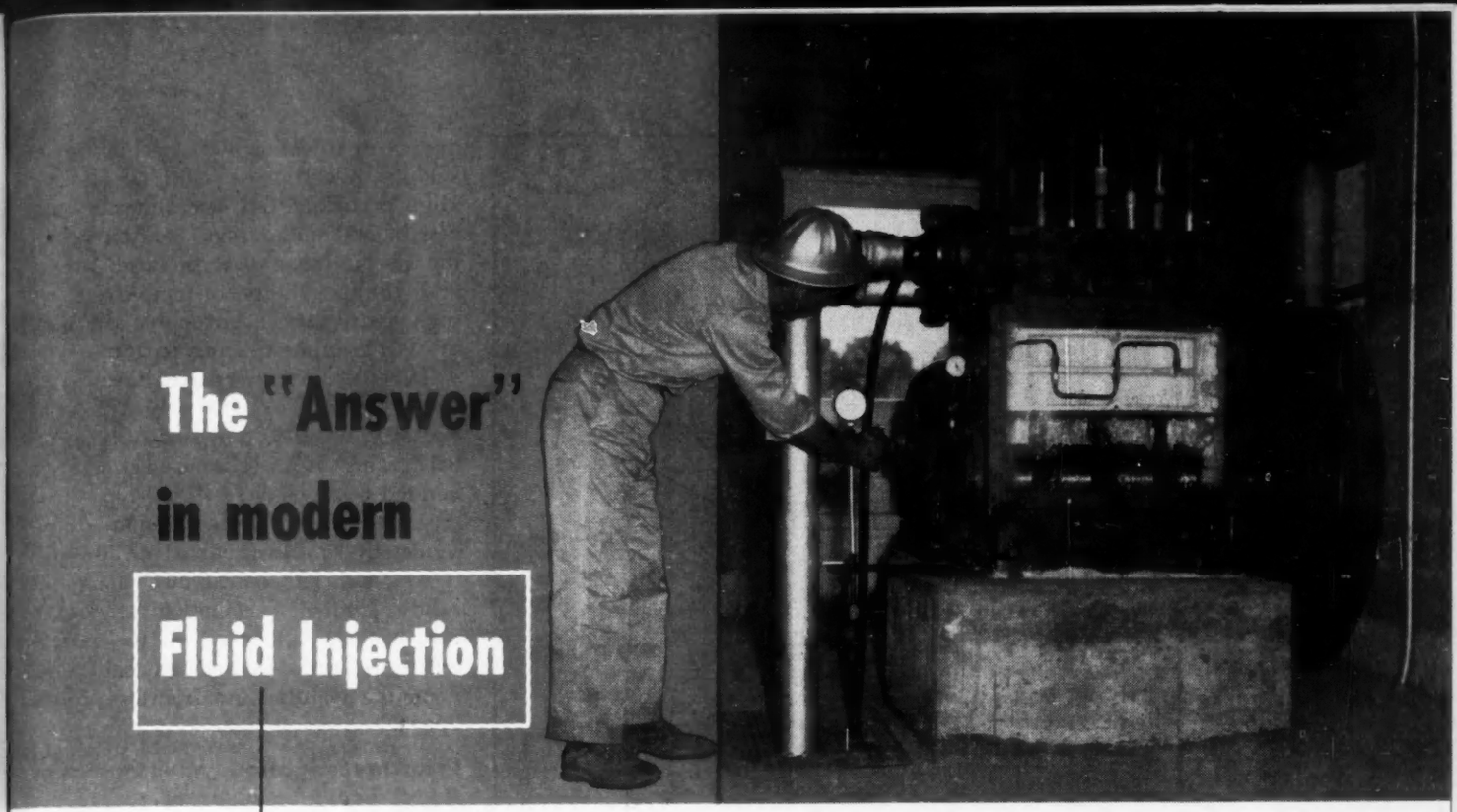


TRUCK-MOUNTED HOT OIL dewaxing unit, including heater, pump, oil tank and controls. Mobile units such as this one permit rapid dewaxing of pumping wells equipped with hollow sucker rods.

Another outgrowth of the development of the hollow rod has been the design of a new-type standing valve with a passage through it which permits the injected fluid to be discharged below the pump thereby enabling injection of a corrosion inhibitor to protect the entire pump from corrosion, or a diluent to thin the crude out just as it is flowing into the borehole and being drawn into the pump.

Bottom-hole pressures have been

Continued on Page 183



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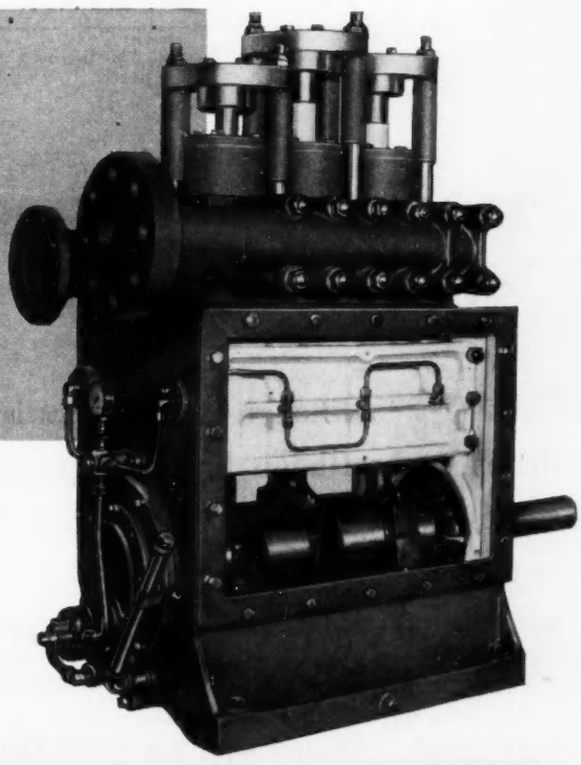

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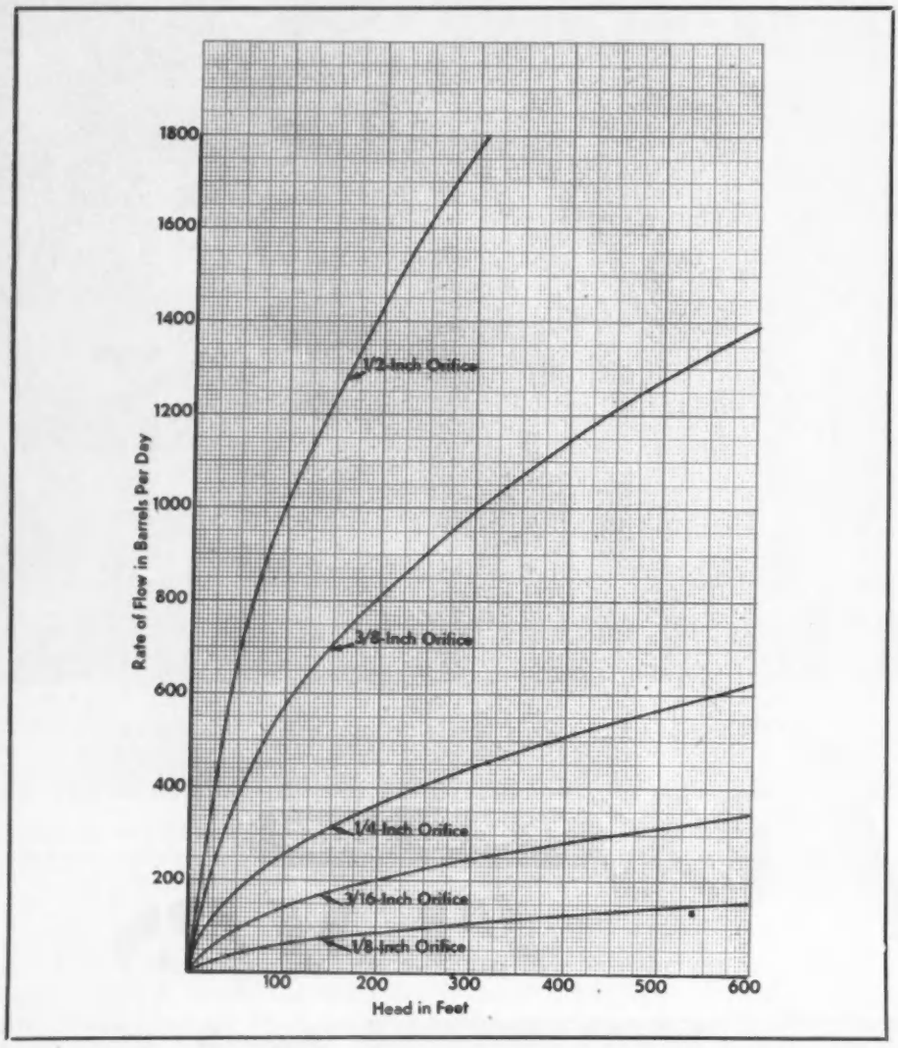

Fig. 1—Calculated flow of water through sharp-edged orifices under various hydrostatic heads.

Flooding Limestones Can Be Profitable

Although not as lucrative as sands, limestone floods in the Illinois Basin are paying off. Here are some successful methods.

By LEON KRAUSE, Ashland Oil and Refining Company, Ashland, Ky.

INTENSITY OF development, capital outlay, and the economics associated with a proposed limestone flood must be judged in terms of anticipated profit. In general, results from flooding lime pays are not comparable in magnitude to recoveries from sand reservoirs. As a rule, lime floods have an advantage in that a nominal capital investment is required to place this type of secondary recovery project in operation. Spacings ranging as high as 40 to 80 acres per input well, and the conversion of present producers to injection wells, reduce development costs to a nominal figure. High permeabilities, averaging in excess of 500 millidarcys, continuity of the porous zone over a large area, and the possibility of employing a high hydrostatic head enable the use of a wide input spacing pattern.

Types of limestones that have been water-flooded successfully are: (1) oolitic in nature, composed of spherical grains of calcium carbonate bonded with calcite; (This type has physical characteristics similar to a sandstone.) (2) crystalline dolomites; and (3) calcareous sands or sandy "limes." Technological progress has not advanced to the point where it is considered advisable to flood the vugular and fractured lime "pays."

Prior investigation. An engineering study should be made of the limestone reservoir prior to initiating the flood to establish the identity and continuity of pay zones in the formation. A structure map should be drawn on a well defined and blanket marker horizon. Wells tentatively chosen for conversion to injection should be selected to affect the largest number of producers surrounding the input. For example, if some wells are producing from the upper break, others from the lower, and a third possibility of both breaks, the selected input should service the largest number of producers in the area assigned to the injection well.

Structural position is of importance because it has been proven from field operations that it is advantageous to place the injection wells on the flanks and move oil up structure.

Wells chosen for inputs should have a good primary production history or a high injective capacity. An examination of the electric log, initial potential, cumulative recovery, and present production will assist in determining the ability of the well to take water. Wells drilled into edge water and possessing sufficient capac-

TABLE 1
Calculated Flow Through Orifices

Orifice Diameter, Inches	HEAD ABOVE ORIFICE—FEET							
	100	150	175	200	250	300	350	400
	VOLUME—BARRELS PER DAY							
1/8	65	78	84	91	102	110	119	128
3/16	144	174	188	203	2:8	248	268	287
1/4	255	310	335	360	40ɔ	440	475	510
3/8	575	705	760	815	910	995	1075	1150
1/2	1020	1240	1340	1440	1620	1775	1900	2040

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ity can be utilized to supplement a natural water encroachment, if present. Occasionally, a mistake is made in attempting to convert tight edge wells to water inputs. Prerequisite of a flood is to get the repressuring media into the reservoir. This can only be accomplished by having good injection wells. Tight wells will function better as producers than inputs in a flood.

The ideal injection pattern for a limestone reservoir is to locate widely spaced input wells on the flanks of the structure. The time required to cause migration toward the dome is longer than the period necessary to obtain an increase from a more intense spacing. However, results of studies indicate that flank drives are more efficient and operating costs are less.

Unitization. In general, it is necessary to unitize leases because of the strategic locations of the input wells which in turn would cause movement of oil across property lines. Common factors for participation formulae are cumulative recovery, present daily production, and number of wells.

How to inject. Various modes of injection have been utilized in flooding limestone reservoirs. The oldest and cheapest method of injection is called the "dump" flood. Pumping equipment is removed from the well, casing opposite a water sand is ripped or perforated, and the brine poured down the casing into the "pay" under gravity or the hydrostatic head exerted by the water sand. There is no control on the injection rate under this system.

There are numerous dump floods in operation in the Tri-State area. Some results have been favorable, and others adverse. Injection rates as high as 5000 barrels daily per input well have been reported.

In order to secure information on injection rates for dump floods, a metering device may be used to measure and control the volume of water. The injection medium is obtained by perforating the casing opposite a suitable water sand and the pay is flooded by the hydrostatic pressure of the fluid column in the well. The metering device is run on tubing with a hook-wall packer set below the perforations in the casing. Water passing through the meter rotates a vertical shaft turbine which operates a set of reduction gears. A cam periodically releases a trip hammer which strikes a metallic block. Sound is transmitted to the surface and can be heard by ear or recorded by a surface instrument. By calibration of the meter, the number of hammer blows in a given period of time is converted to volume. Cost of the metering device and recorder, exclusive of the packer and tubing, is approximately $1500.

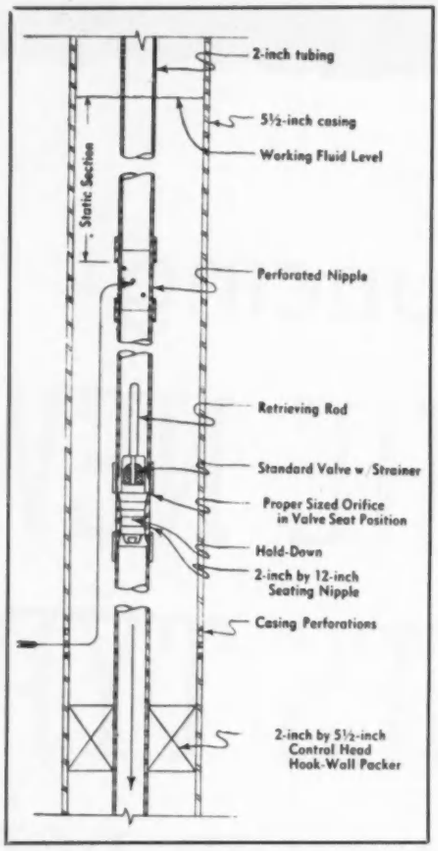

Fig. 2—Schematic diagram of completion program for injection well equipped with an orifice control. Water flows by gravity from upper sand into reservoir below. Orifice controls injection rate.

Some installations use a surface injection system which consists of a water source, pressure pump, and all the accessories common to a typical sand flood. An example of this type of installation is the Birk City Flood, located in 18-P-27, Henderson and Daviess counties, Kentucky. There was evidence of results from an accidental flood in this pool, and the various operators agreed to a co-operative plan of flooding. Five input wells were placed in operation to serve approximately 380 acres in the flood area. Water was pumped from the Green River, metered and injected into the inputs. Prior to the initiation of the planned flood, the pool had produced approximately 1,350,000 barrels of oil. Cumulative recovery to date is 1,780,000 barrels or 430,000 barrels of secondary oil. The flood oil recovered to date is 24 percent of the primary recovery prior to secondary operations. The surface injection system has the advantages of control on rates and pressures, but is also expensive.

A modification of the surface injection system is a well equipped with a cross-over packer and a conventional pumping unit. By means of a system of packers, water is obtained from perforations in the casing opposite a water sand, raised to the surface, run through a meter loop, and injected in the oil pay in the same well. The pumping unit and the in-well pump serve a dual purpose in lifting water and injecting it into the oil zone. An *improvement* on the dump flood method and a relatively inexpensive installation is the controlled subsurface injection system. A mechanism consisting of an orifice mounted in a cage and hold-down, and housed in a seating nipple is run on tubing in conjunction with a control head hook-wall packer, as shown in Figure 2.

Pumping equipment is removed from the proposed input well and the oil producing zone is given a wash with 2 or 3 barrels of acid. A brush or bridge-plug is placed below the selected water sand and the pipe is perforated to allow entrance of brine into the casing. The well is then swabbed to remove drilling mud and particles of cuttings and cement behind the pipe. The well is allowed to stand and reach equilibrium in order to determine the static fluid level in the hole. The well is then swabbed at a rate approximately equal to the desired daily injection volume for the well. Notation is made of the drawdown and the working fluid level for the withdrawal. From this information, the orifice and seating nipple depth is calculated. A given size orifice will have a through-put volume dependent upon the differential head; or with any two known factors of the following three namely: daily rate, orifice size, and differential head, the third factor can be calculated. See Figure 1 and Table 1.

After water data are secured, the bridge plug is knocked to bottom, and the packer on tubing and the seating nipple are set at the desired depth. The packer is set below the perfora-

tions in the casing. Brine enters through the perforations into the annulus between the casing and tubing, and rises to a set of open tees, a gas cage or perforated nipple, thence down the tubing through the orifice and into the pay zone. The orifice disc is substituted for the ball and seat in the cage and hold-down. A short piece of rod is screwed in the top of the cage to permit retrieving with a rod socker.

The installation depends on gravity, or the hydrostatic head of the column of water. Pressure on the downstream side of the orifice must approach zero because there are no means to measure the pressure with this arrangement. A well with a good primary history or of good injective capacity must be selected for conversion.

The installation has some measure of flexibility. If a large volume is desired, the cage is pulled and a larger orifice inserted. For smaller rates, a smaller orifice is used.

Conversion cost. Cost of conversion, excluding the value of the tubing, is approximately $1800 per well. Major items of expense:

Cable tool rig—	
5 days @ $200.00	$1000.00
Perforating	450.00
Packer	275.00
Orifice control	60.00
Misc. supplies	25.00
Total	$1810.00

Some reduction in cost could be affected by contracting a number of input wells in order to reduce the minimum rate on the rig. There are other expenses incident with operations which must be taken into consideration.

Operating notes

- Select a well that has been a good producer. Attempts to reacidize a poor well that had previously been given full treatment usually have been unsuccessful.
- Perforate the casing opposite the water sands where there is cement behind the pipe. Sloughing of mud and caving shales will plug-off perforations.
- Have a small petcock on the casing head to vent dissolved gas in brine. If this precaution is not taken, the system will gas lock. The whistling from the vent is an indication to the pumper that the well is working properly. Check for trouble if there is no sound.
- Use good clean tubing above ori-

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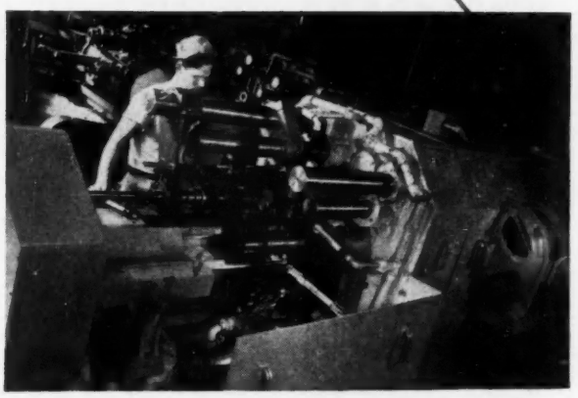

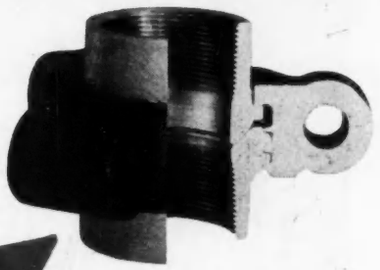

WECO FIG. 100 UNION

Advanced Manufacturing Practices

• At WECO, the manufacture of wing unions for the oil industry has become a highly specialized and precision process.

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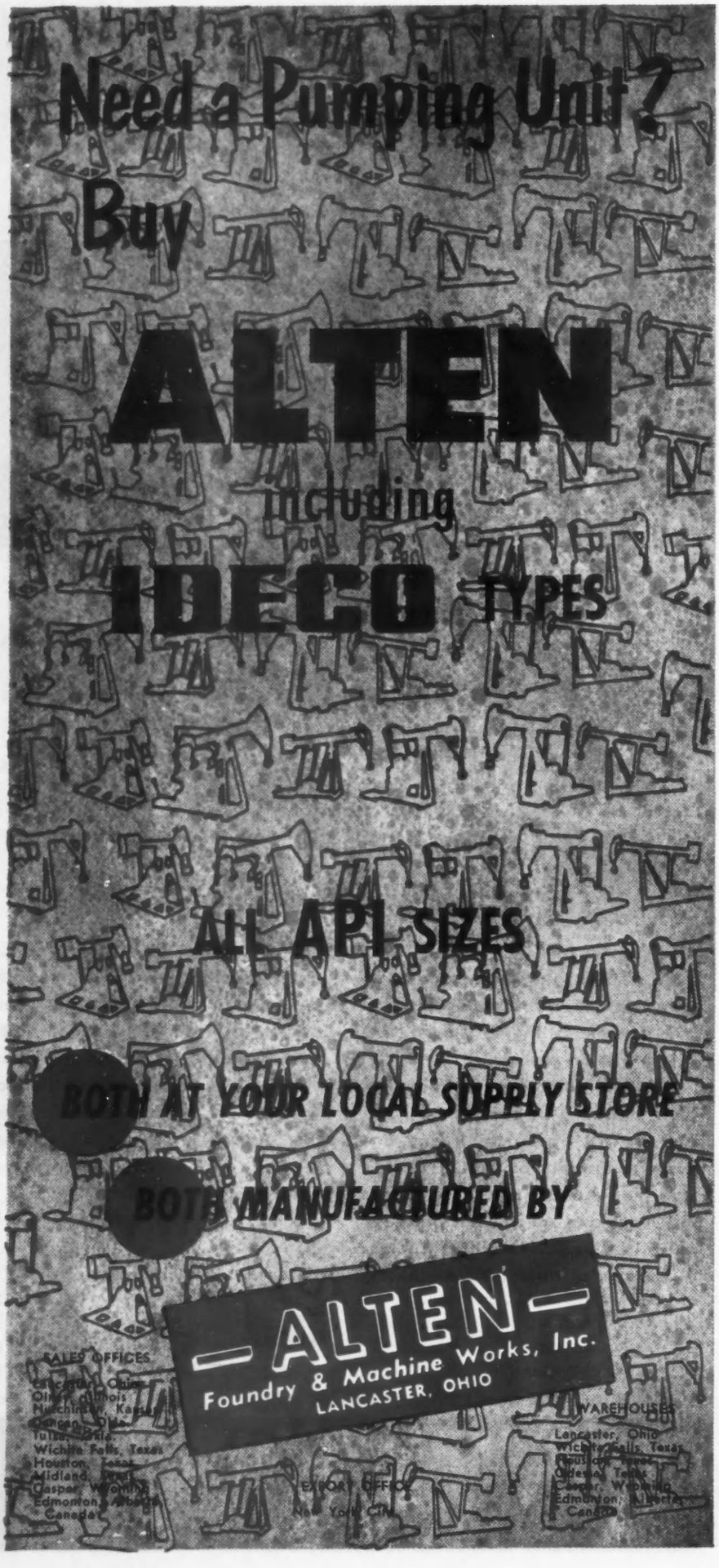

fice to reduce accumulation of pipe scale, paraffin, and sediment on cage and orifice.

• Make provisions for fuel if dependent upon gas.

• Run a float periodically. A rise in fluid level, approaching or equal to the static, indicates plugging of the orifice or pressuring-up of the formation. A serious drop in fluid level indicates plugging of perforations in the casing, a decrease in the productivity of the water sand, or a packer failure.

• Anticipate erratic behavior. Occasionally production will have a tendency to "slug" with total fluid produced in excess of the capacity of pumping equipment. Daily production curves will have peaks and depressions in spite of constant operating practices.

• Do not abandon a producer immediately offsetting an input. If the oil well has failed to respond, others more distant may have increased in production. Water may be moving down structure, or following the path of least resistance. Reservoir fill-up, vertical permeability, and control of rates on producing well will eventually cause the reluctant producer to respond.

Watered-out producers occasionally can be brought back on oil production by rearranging inputs and exerting the drive from a different direction.

A matter of economics. These procedures are presented only as suggestions. Economics of the project are the controlling features which will ultimately decide the type of injection to use. Records to date give recoveries for flooding limestones ranging from 15 to 35 percent of primary recovery, and in some isolated cases, as high as 50 percent of primary recovery. Effective natural water drives, augmented by the injection of extraneous water in the early life of a pool, constitute a separate classification with considerably higher recoveries. Knowledge of the reservoir, characteristics of the pay zone, and production history are of paramount importance in evaluating the secondary recovery potential of a limestone reservoir by water flooding.

—**The End.**

ACKNOWLEDGMENT

Presented by the author at the Kentucky Oil & Gas Association meeting, Lexington, Ky., June 5, 1953, under the original title, "Review of Techniques Used in Flooding Limestone Reservoirs in the Tri-State Area."

Hollow Sucker Rods

Continued from Page 174

determined rapidly and inexpensively by injecting nitrogen gas down the hollow rods to the bottom of the hole, balancing it there, and calculating the brake horsepower from a surface pressure gauge reading and adding the weight of the column of gas.

Of course, the predominant usage is still in the dewaxing of wells. In some cases this dewaxing may be necessary as deep as the top of the perforated interval itself. In such cases hot oil at times has been known to melt the wax out of a portion of the perforations and resulted in increasing the production after treatment.

Field conditions. Widely varying field conditions have been experienced and it is quite difficult to generalize on the maximum depth of wax or paraffin deposition, the exact hot oil temperature necessary to clean a particular well, or the number of barrels of heated oil to do the job. One well in the Santa Paula area of California, after a little preliminary experimenting, was found to require 16 barrels of 240° F. oil and to take 40 to 45 minutes to do the job. At almost the same depth and rate of production, another well in the Rincon Field, California, required only 12 barrels of 190° F. oil and a treating time of 20 to 25 minutes was sufficient. Gravity of the oil is an important factor as well as the percentage of wax concentration in the crude. Chemical composition of the paraffin base and the percent cut are other factors which influence the ease or difficulty of cleaning a well. Once the proper procedure has been determined, it generally holds true for all wells in a particular field, and will give satisfactory results with minor adjustments for much of the remainder of the life of that group of wells.

Economies. Substantial economies are reported by operators using hollow sucker rods. One operator in the South Mountain field, California, estimates a saving of $45 per well for each dewaxing operation as compared with conventional methods. Another operator in the Santa Paula area who has 113 wells equipped with hollow sucker rods has reduced his average lifting costs from 34 cents to 14 cents per barrel of gross oil pumped.—**The End.**

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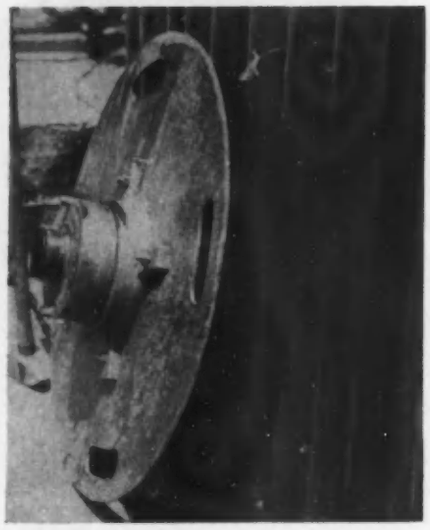
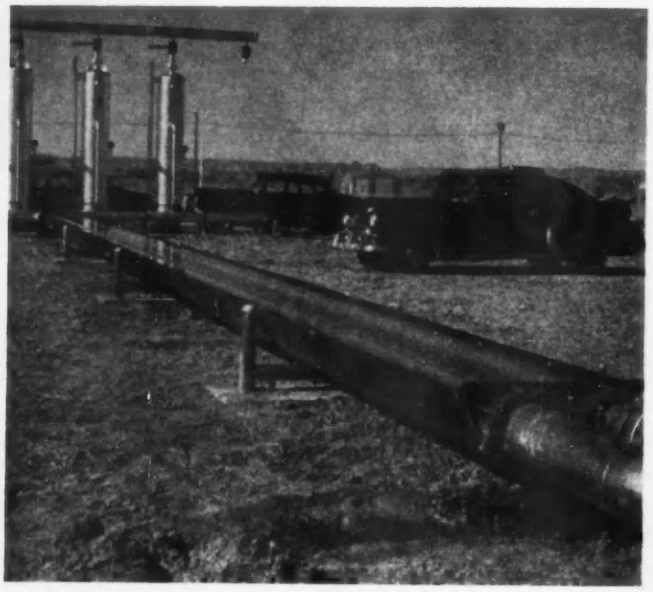


Circular Steel Table Aids Pulling Jobs

Rod and tubing tongs, along with other tools used in pulling rods may be supported temporarily on a steel table surrounding the well head. When pulling a pumping well, the roustabout crew using the makeup or breakout rod tongs must lay these tools on the floor when handling the rods. After each single or double is pulled or madeup, the tongs must be picked up for use again. This circular steel table screwed into the well head by means of an adapter has eliminated much of this back bending.

The table is made of one-fourth-inch plate steel measuring about 30 inches in diameter. It is attached to an adapter as shown by means of four metal tabs bolted to the steel plate. The adapter can incorporate a rod stripper if desired, and the bottom connection screws directly into the well head. Four hand holes are cut in the table to facilitate placing the table in position and removing it. Height of the table depends upon the height of the stuffing box connection. Not only does this table eliminate back bending to pick up tools after each connection, but it speeds running and pulling rods.

Open Water Trough Cools Stripped Gas



An open trough filled with water serves to drop the outgoing gas temperature from this desorber unit about two to three degrees. Incoming gas at about 50° F. flowing through an adjacent line also emersed in the water bath, adsorbs some of the heat given off by the hot outgoing gases.

This installation was made on the incoming and outgoing gas lines at a condensate stabilization or desorber unit. Incoming gas at about 350 pounds per square inch contain condensates which are separated out in the separators. The separated gas is used to cool the stabilized liquid product going to storage. In doing so, the gas picks up about 30 degrees of temperature.

Since the stripped gas goes to a natural gasoline plant where it is further processed, low temperatures are desirable. In order to maintain gas supplied the plant at lowest possible temperatures without installing additional heat exchanging equipment, this trough was made of 28-inch O.D. casing. About 80 feet long, it was fitted with sleeve type couplings at either end so the eight-inch gas lines could be inserted through them and then tightened to prevent the water from leaking. The trough was set horizontal and supported on elevated cross frames set in concrete foundations. About 25 million cubic feet of gas flow daily through the stabilizer unit, and outgoing temperatures are reduced several degrees, depending upon the ambient temperature of the season.

Salvaged Casing Used As Open Drainage Ditches

Draining water, sediments and paraffin sludge from the bottom of stock tanks can be accomplished with little mess by using an open metal ditch made from salvaged surface pipe.

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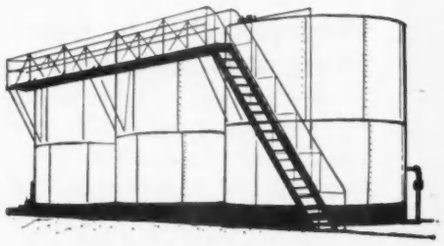
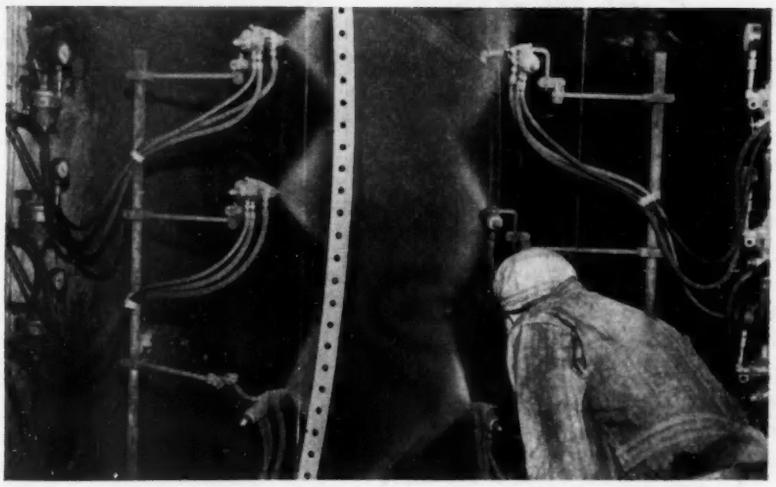


Butler stairs and walkways are easy to assemble, give years of service. Fit all A.P.I. bolted tanks; may be used in many other ways.



Every sheet in a Butler bolted steel oil tank is completely protected with quality galvanizing or painted coatings. This is your assurance of rust and corrosion resistance that means extra years of low-cost crude oil storage.

Galvanized tanks are hot-dipped after fabrication so that every edge and bolt hole is protected. Painted tanks are coated with primer and sprayed with aluminum paint. Modern electrostatic spray equipment assures complete, uniform coverage. Aluminum decks are available with either painted or galvanized tanks. Sizes range from 100 to 10,000 barrels. A.P.I. specifications are followed on all tanks.

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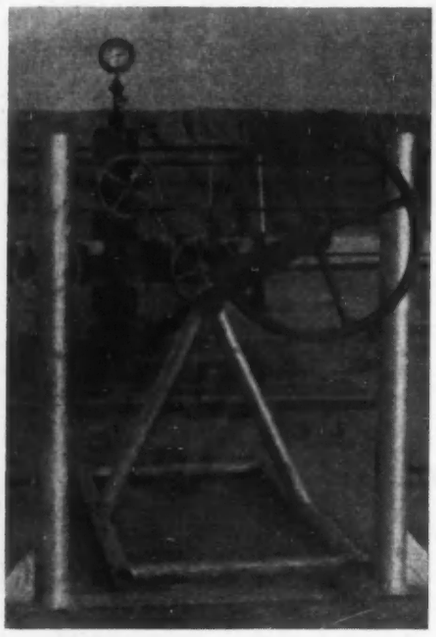
Make the ditch by splitting 20-inch casing and welding the half sections end-to-end. Place these sections in a shallow trough dug in the ground and braced by short flat iron stakes bolted to tabs welded to the edge of the open pipe. This ditch discharges into a sump inside the battery enclosure. By use of the transfer pump, any oil carried with the water can be removed and run back through the gun barrel or heater-treater. Sediments and water can also be pumped to a burning pit if desired.

Two-inch drain lines from each tank bottom are welded to the ditch as shown. An ell on the end of this line directs the flow of tank bottoms down the open ditch. By maintaining this tank cleaning ditch, the battery itself is kept in better appearance and the fire hazard caused by oil and paraffin on the ground around the tanks is reduced.

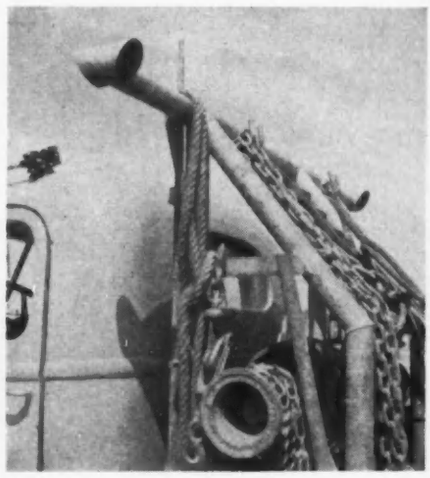


Master Valve Extension Cuts Closing Hazard

It is advisable on wells which produce sour crude and gas with relatively high concentrations of hydrogen sulphide to provide some means of closing in the well some distance from the well head. Small concentrations of H_2S may overcome personnel who may be working in the immediate vicinity of the well. When leaks around the well head are detected, it may be necessary to shut the well in by closing the master valve on the tree.

This producing well flows unusually sour crude, and is equipped with an 18-foot extension on the master valve stem. The extension is made from two-inch pipe split at the end and bolted to the valve handle of the master valve.

The opposite end of this extension contains a four-spoked hand wheel supported by a small triangular pipe frame. The extension passes through a three-inch nipple welded to the apex of this support resting on a box footing. This extension device is placed at the entrance of the fence enclosure surrounding the well head so that the pumper can shut the master valve prior to working on the well connections, such as changing chokes, etc.



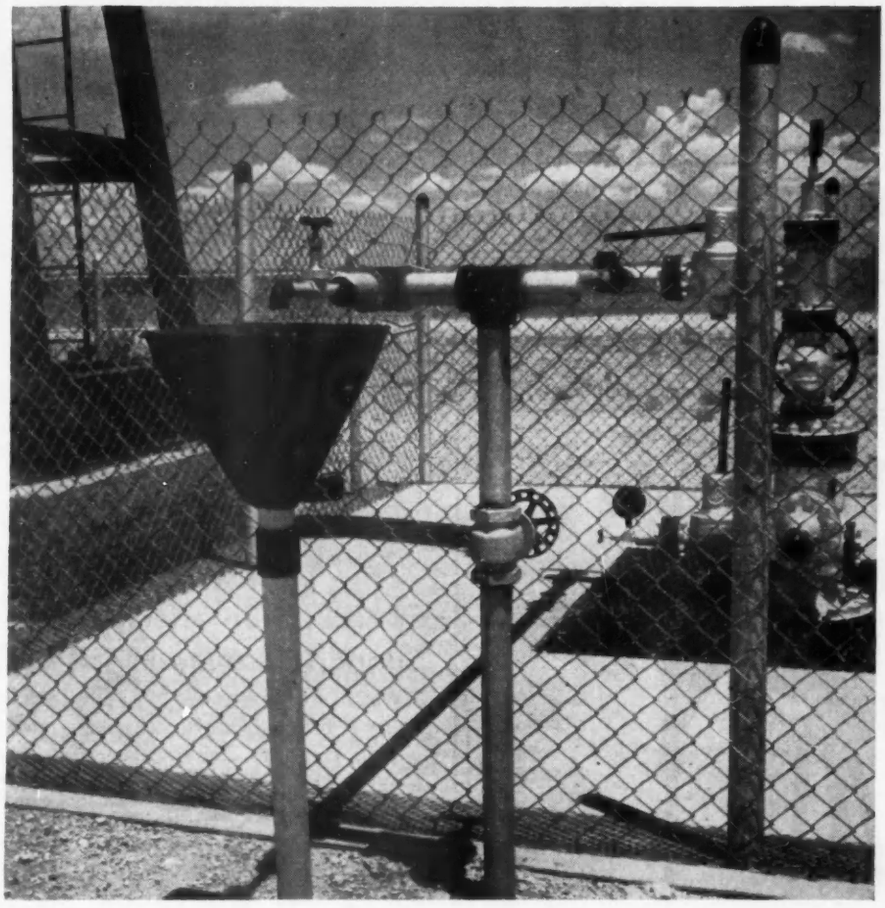
Placing Lights in Pipe Eliminates Breakage

Mount running lights inside pipe on the headache posts of oilfield-bed trucks and eliminate their frequent breakage and replacement.

Ordinarily, the running lights are mounted on back of the truck cab. Here, they are frequently broken when chains, boomers and loads are hung on the headache rack. Also, they are frequently obscured by loads that rise above them.

By extending the top part of the rack out beyond the bed of the truck and welding a short piece of pipe onto it as shown in the photo, you can protect the lights and at the same time, make them easier to see when bulky loads are on the back of the truck.

In constructing the headache rack, make provision to run armored cable to the lights. The best way to do this is to run a wire line inside the pipe along the path of the conduit as rack is welded up. The two-way light fitting can be purchased at almost any auto supply store.



Funnel Device Collects Oil Overflow

Eliminate unsightly oil drippings around the well by taking samples for shakeout tests from a specially-prepared device that includes a metal funnel to collect any overflow. This is a flowing well with a tubing pressure of about 205 pounds per square inch. A tee is added in the 2½-inch flow line riser above ground just outside the wire fence enclosure. Connections are added at the tee as shown to provide a means of taking samples through three-quarter-inch valves. A funnel measuring about 14 inches across each side at the top is welded together from sheet steel. Bottom is welded to a short 2½-inch nipple that connects into the waste line. This line discharges the overflow oil onto the ground at a point about 50 feet from the well head to eliminate any fire hazard as well as any unsightly oil drippings.

Gas Condensate Flow Lines Heated to Stop Freezing

In order to eliminate pressure reducing fittings in a high-pressure gas condensate line that tends to freeze up when flowing temperatures reach 85° F., hot oil is circulated in the annulus of a concentric outer eight-inch casing. Full line pressure can be carried up to heating equipment which enables the line pressure of 1600 pounds per square inch to be lowered to working values.

The three-inch gas condensate flow line is enclosed inside eight-inch casing and sealed off at either end around the smaller line. Hot oil is pumped

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Reda engineers have long been associated with water flooding operations and are fully qualified to assist operators in discussing their source water requirements.

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into the annulus at one end and drawn out at any point desired through a two-inch parallel line tapped into the eight-inch casing at strategic points throughout the full length of the heat exchanger unit.

To insulate the entire installation, a wooden box can be erected around the unit and covered with composition roofing paper to keep out rain. This box is filled with granulated insulating material.

In the winter when temperatures drop below zero, it may be necessary to circulate hot oil the full length of the exchanger. This can be done by shutting off all return bypass valves. During summer months when only a slight amount of heat need be added to the flow line, the end of the heater flow line is closed, and only the return bypass line is opened at the point where the hot oil is to be taken out of the unit. This installation has prevented troublesome freezing which formerly caused well shutins.

There's More Than Meets the Eye Here!

Any producer familiar with oil pumping equipment will immediately recognize the streamlined design of this big JENSEN Pumping Jack—but what you don't see is most important! The heavy welding on base, post and beam—anti-friction bearings—precision shaved gears—oil bath lubrication—and these important features contribute to the trouble-free, economical operation of JENSEN Jacks.

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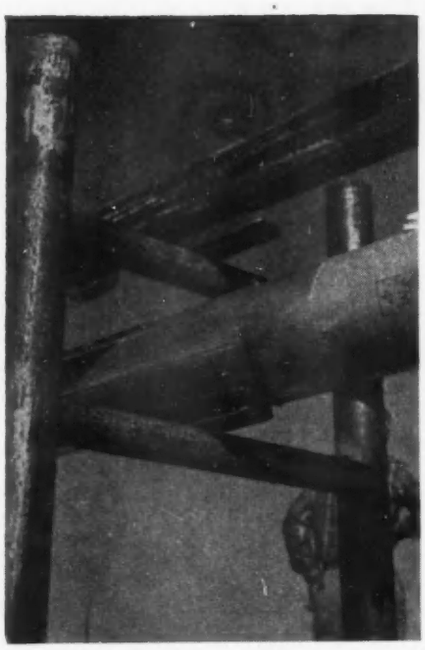


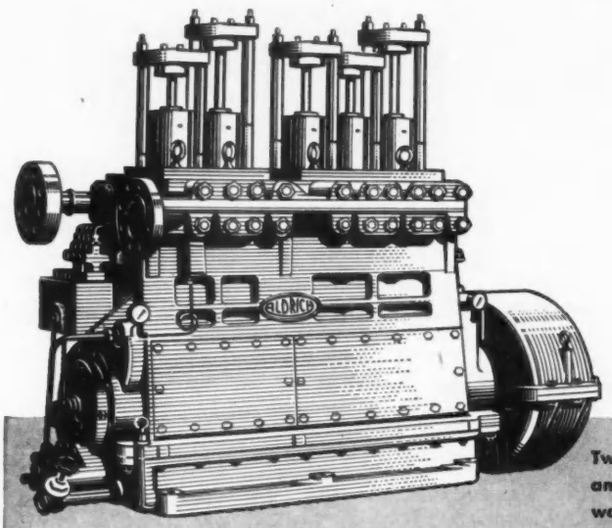
Special Shoe and Rack Support Insulated Pipe

Metal shoes welded to the lower side of lines carrying hot condensates provide a standoff which protect insulation and permits the line to expand and contract. The top four-inch line carries liquid condensate to an indirect heater which operates at about 450° F. The condensates are heated up to about 380° F. and returned through the lower four-inch line. The heater was located about 150 feet from the field stabilizer unit, and the bottom line had to be supported about four feet off the ground. Since the line was subject to considerable expansion, it was necessary to weld skids or shoes to the pipe so that it could slide back and forth across the horizontal supporting frames. Insulation was added to minimize any loss in heat in both lines.

Each shoe is made from a 10-inch section of H-beam steel. One web of the beam is cut off with a cutting torch and a tee member formed. Bottom of the tee is welded to the lower side of the line, and the end of the flanged shoe bent upward slightly. Shoes are made from three-inch H-beams, so that when welded to the pipe, adequate space is provided between the pipe and the shoe to accommodate a layer of insulation. Cutting the insulation to fit around the shoe is of little trouble, and the insulation is protected from injury. The line is free to expand and contract across the horizontal supporting frames anchored in concrete footings.

For UNINTERRUPTED water flooding service

. . . it will pay you to use Aldrich Direct Flow Pumps

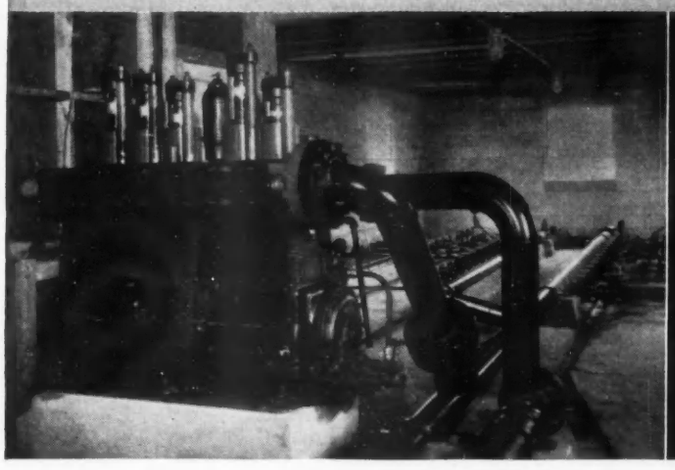


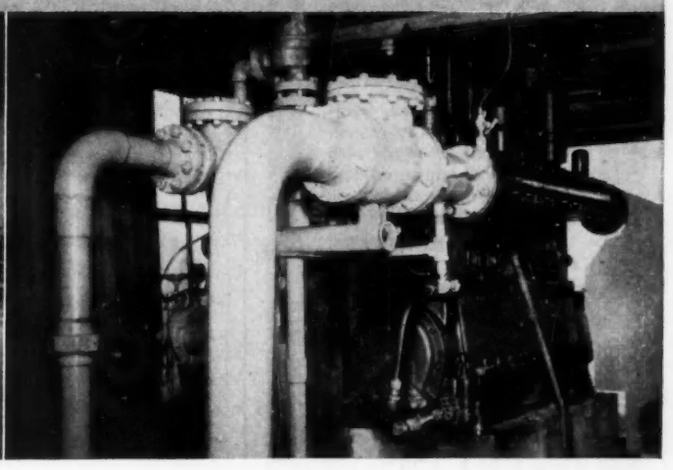
Their record will tell you why. On a large number of water flood projects throughout the country, Aldrich Pumps are providing continuous operation at high pressure . . . critical "musts" in this form of secondary recovery. Operators have found them not only dependable, but also highly efficient.

For water flooding Aldrich can supply you with a pump to meet any volume or pressure requirements you may have. Aldrich Pumps range from a 3"-50 hp triplex, through 5" triplex and multiplex, to the 6" series ranging up to 900 hp.

Get in touch with your nearest Aldrich Representative . . . or write us directly. Data sheets are always available upon request.

Two Aldrich Direct Flow Pumps on the job on water flood operations. At left is an Aldrich 5" stroke motor-driven Quintuplex Pump used for pumping salt water at the Osage #2 property of Winona Oil Company, Flat Rock, Okla. On the right is an installation at Skiles Oil Company, Mt. Carmel, Ill., where a similar Aldrich unit pumps fresh water at 120 gpm against 1450 psi.





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TABLETS REMOVE AND PREVENT RUST AND SCALE IN ALL RADIATOR COOLING SYSTEMS

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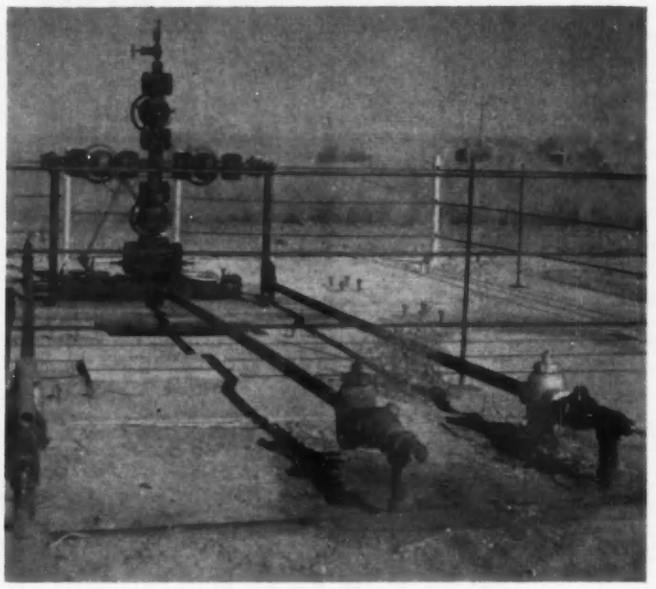
Hot Oil Stops Hydrate Formation in Well



An intermediate string of opened ended casing has been used successfully to divert hot oil down the hole and up around the production string to melt out frozen hydrates that plug the tubing in gas condensate wells. This particular well produces from a relatively low temperature reservoir. Bottom-hole temperature at 7600 feet is approximately 104 degrees Fahrenheit, and bottom-hole pressure is about 3000 pounds per square inch. Hydrate point under these conditions is about 85° F. During winter months, such temperatures in the well below the surface are not uncommon, and wells freeze up frequently.

Completion of such problem wells called for an intermediate string of 5½-inch casing hung to about 3500 feet inside seven-inch production

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CLEAN OUT CHOKING SAND

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PUMP & BAILER SIZES
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Composite Catalog Page 3433

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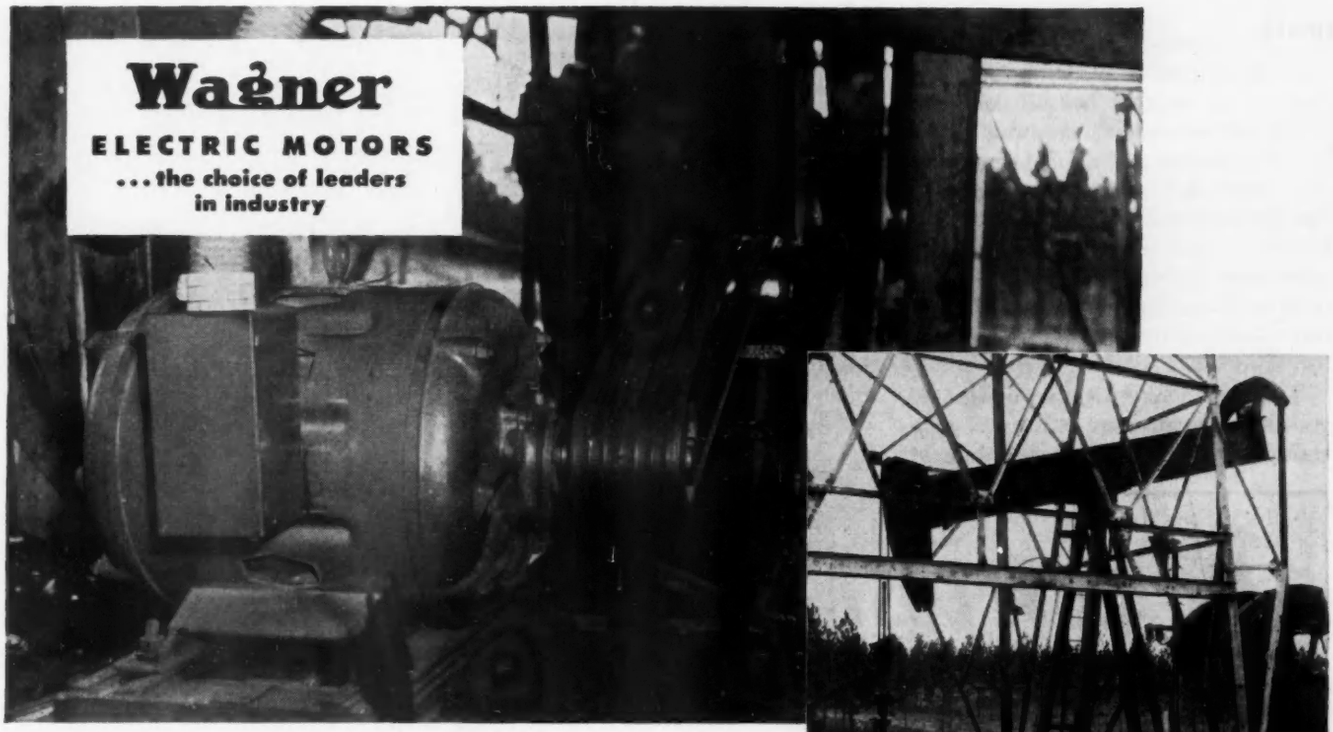

Wagner multi-speed motor maintains maximum allowable production from 9 gravity oil well

Obtaining allowable production of 232 barrels a day from this 7,200 foot oil well at Ovett, Mississippi, presents a real problem. The viscosity of the raw production is so great that warmed oil must be circulated in the near surface depths of the well to even enable it to flow. A butane engine on the rig was able to pump only 100 barrels a day.

Then a Wagner four speed motor was installed on the rig. The motor starts pumping at 575 rpm. As the crude oil warms and becomes more pumpable the speed of the motor is increased to 870 and then to 1160 rpm. Allowable production can normally be reached by pumping at the third speed, but if it should fall behind, the fourth speed (1750 rpm) is available to bring production up to the maximum.

Wagner Multi-speed Motors are furnished with any type of housing—open drip-proof, totally-enclosed, explosion-proof, splash-proof, etc., and with various electrical characteristics such as normal torque, high torque, etc.

The loading pump on this installation, not shown, is driven by a 20 hp Wagner splash-proof motor.

For your requirements, there is a Wagner Motor to fit every need—a complete line for all current specifications, with a wide variety of enclosure types and mountings. Bulletin MU-137 gives full information. Do you have a copy?

Your nearby Wagner engineer will be glad to help you select the *right* motors for your next application. Call the nearest of our 32 branch offices, or write us.

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AUTOMOTIVE BRAKE SYSTEMS – AIR AND HYDRAULIC

BRANCHES IN 32 PRINCIPAL CITIES

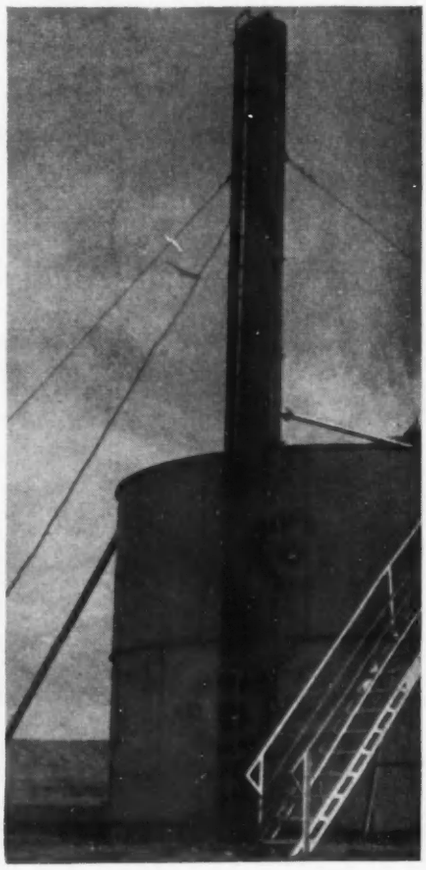
M53-20

pipe. Bottom of the 5½-inch casing was opened so that hot oil could be circulated between the annulus of the 2½-inch tubing and the 5½-inch casing, down the hole and up between the 5½-inch and seven-inch casing. During winter months, hot oil was constantly circulated at about 150° F. to keep this zone just below the surface warm enough to prevent hydrate formation.

The well hookup is shown. Hot oil goes into the annulus of the 5½-inch casing through the two-inch line at left, and leaves the well through the two-inch line at right connected to the seven-inch casing annulus. The well produces through both wings of the tree, and these lines tie into one flow line seen here between the two hot oil lines.

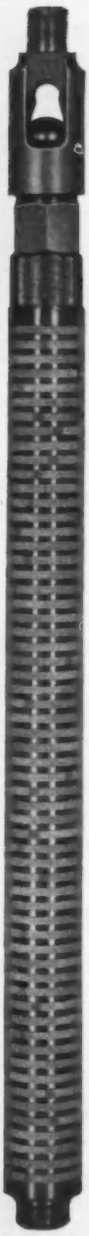
'Boot' Added to Tank Knocks Out Sour Gas

An extra large "boot" was added to this tank primarily to knock out as much of the sour gas as was practical without using additional equipment. Reason for removing as much of the gas as possible was to minimize the hazard when gauging the tank. A layer of sweet gas was maintained on the oil by means of a pressure-regulated field gas line. This method of protecting the pumper was more effective if most of the gas which was entrained in the oil could be separated before the oil was stored in the tank.



A 40-foot section of 24-inch casing served as the vertical "boot" or extra separator. It was sealed off at top and bottom, and contained a series of baffles inside. A two-inch line carried the sour crude from the separators to a point about two-thirds up the "boot." The oil hit the baffles and caused the entrained sour gases to escape. These gases were carried off from the top of the boot through a four-inch line and burned. A back pressure valve in this gas line held only a slight amount of pressure on the separator or "boot."

Oil flowed from the "boot" into the storage tank through a line connected to the bottom of the vertical chamber and to the bottom of the tank. Glass gauges spaced along the outside of the "boot" indicated the fluid height inside. This 40-foot section of casing was guyed for safety against being blown over in high winds. It was set on a concrete foundation and tied down by anchor bolts.



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BLASTING UP AHEAD on 20-inch loop recently installed for Dallas-Fort Worth area. Line brings new supply from rich East Texas fields into big metropolitan centers through company plant at Athens. Eastern terminus is Carthage.

Lone Star Dates Back to 1909

Lone Star Gas Company was born in the boom—the boom of 1909. It is one of the granddaddies of modern gas transmission companies and key personnel in many another company today comes from Lone Star. Today the company is still growing.

BACK IN 1909 the infant natural gas industry was experiencing a "sensational boom" as the result of a great period of prosperity which was sweeping the country following the financial and business depression of the previous year.

U. S. Department of Interior reports for 1909 valued natural gas production and consumption at an all-time peak of $63,206,941 and Texas alone reported 5035 domestic and 130 industrial customers enjoying the luxury of the new fuel.

Up in a room at the old Oriental Hotel in Dallas that spring a small group of men completed plans for launching an independent production and transmission company in Texas which would take its name, appropriately, from the Lone Star state. On June 4, 1909, they applied for and were granted a charter to operate the Lone Star Gas Company, which pioneered the first long distance transmission of natural gas in the southwest.

To connect gas wells the company owned in Clay county with an immediate market area, the men contracted for a 95-mile, 16-inch line from Petrolia field to Fort Worth. The following February the line delivered gas to the city gate at Fort Worth where it replaced manufactured gas for the city. Four months later it was extended to Dallas where speech-making and a roman candle used to light a gas torch in front of the old Chamber of Commerce building, marked the arrival of natural gas.

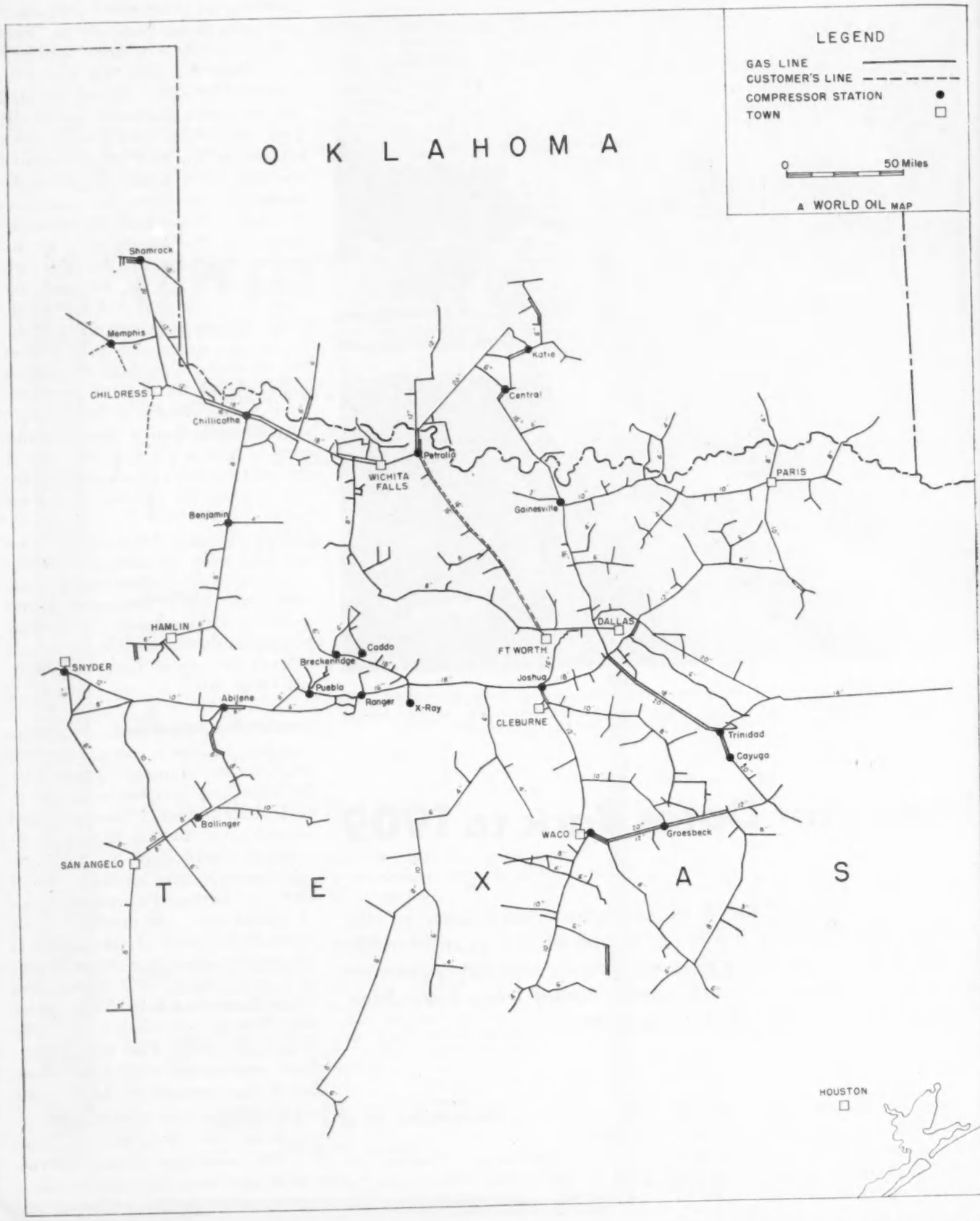
From this small beginning 44 years ago has grown an integrated system of pipe lines, compressor stations, gasoline plants and producing areas and a total of 420 town and city distribution plants throughout 150,000 square miles of territory in Texas and southern Oklahoma.

Leadership Important. In human equation, 44 years is young. Lone Star Gas Company is young but the youthful years were packed with experiences, trial and error, pioneering and progress, and another important ingredient called leadership.

The first 95-mile, hand-laid line of 1909 has lengthened to more than 15,777 transmission and distribution line miles. And typical of this growth is the amount added in a recent 10-year span from 1942 to 1952. During that period Lone Star laid 6080 miles of pipe, mileage equivalent to twice the distance from New York to San Francisco. And today a single small distribution plant operated by the company serves as many customers as were reported for the whole state of Texas in 1909, with total number of customers well over the 655,000 mark for the system.

Map of the Month

Lone Star Gas Company



For the first 17 years, the company continued to sell gas wholesale at city gates to unaffiliated distribution companies. As customer demands increased it faced the problem of finding new sources of supply to augment the dwindling wells in Petrolia field. The first few years were a period of bitter struggle with lines constructed to new fields only to find them inadequate. The science of conservation was almost unknown at that time and vital supplies were frequently blown into the air.

World War I added hardships. There was no money, no credit, no materials and a severe labor shortage, plus the diminishing gas supply. It was a dark hour for the company which tried to meet its construction problem by bringing in carloads of Mexicans from San Antonio. With a square meal at the grub tent under their belts, many of them walked out without touching a shovel. The company paid as much as 15 percent for borrowed money during those war years to tide them over.

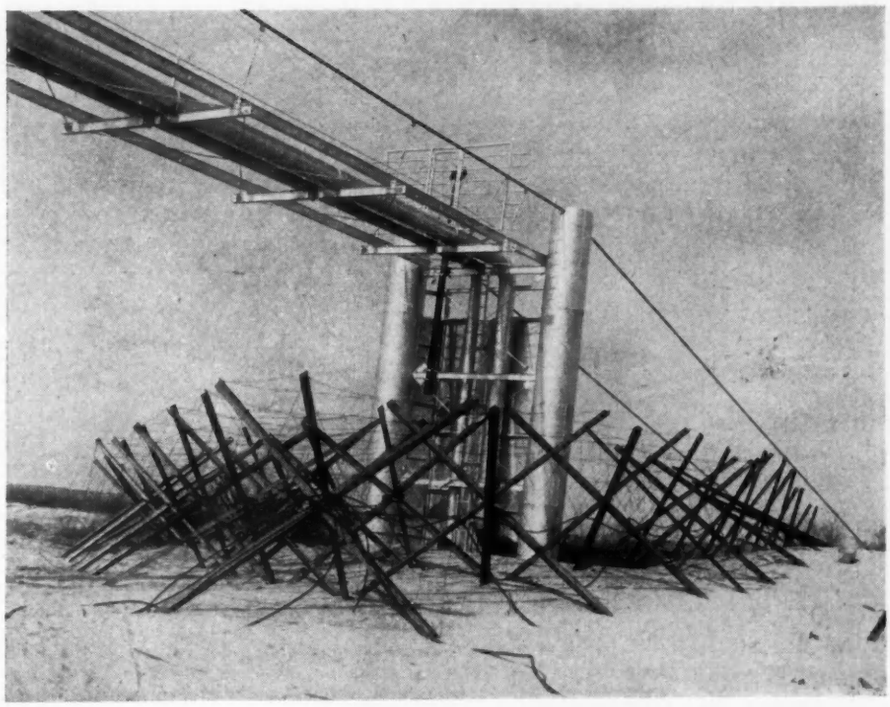
Cold weather demands between 1915 and 1924 often found the company without sufficient supply to meet customer needs and on three separate occasions during this period Lone Star faced receivership proceedings in the courts because of inability to furnish an adequate supply of gas.

Skill Paid Off. But the company had begun to draw men of skill from the ranks of gas men in older producing states and skill and perserverance began to pay off. In 1924 engineers perfected a method of using casinghead gas being blown into the air from absorption plants in West Texas. It was the turning point in the fortunes of the struggling company.

Management could begin to turn its attention to expansion and increasing markets for the supply which was at last fairly secure. Plans were made to combine production, transportation and distribution facilities with the thought that common ownership and control would assure the most effective service to customers. Within a four-year period beginning in 1924, the company pushed one of the largest wholesale construction programs undertaken by any company in the area, by building 200 distribution plants in Texas and Southern Oklahoma.

Small distribution companies adjacent to its pipe lines were purchased and, following organization of the Lone Star Gas Corporation in January, 1926, Fort Worth and Dallas distribution properties were purchased. Gradually other distribution properties were acquired and gas production and gathering systems were combined with the growing operation.

Production and engineering know-how increased with the addition of highly trained people who caught the vision of still greater achievement and service to a section of the country which would one day become one of the fastest growing areas in the nation.



STEEL JETTIES installed around Lone Star's Red River crossing near Byers, Texas, have built up soil and vegetation to keep changing river channel from company's north anchor block. Jetties recently added are part of major project which began in 1928 when first wooden jetties were set up. Recent installation included 633 units laced with barbed wire.

LINE OF JETTIES, laced together with heavy cables, runs 1500 feet upstream from bridge which can be seen in distance. Working area shown was once river channel reclaimed in previous jetty installations.

LINE BREAK 51 feet beneath surface of Lake Texoma called for talents of deep sea diver, shown above being helped into diving gear. Company pipe line men built barge of 2 by 12-inch planking floated on 18 oil drums. Diver used water pressure through pump at right to "wash" bell hole around small leak in 12-inch line which brings gas from Cumberland field into Lone Star System near Durant, Okla.

GOING DOWN for preliminary look at line trouble, diver reported four feet of silt covering line. Plan to weld leak which was on underside of line was discarded after he found it impossible to keep bellhole from filling in. Line was finally repaired with split sleeve. Longest working period under water was four hours.

New Phase Begins. As early as 1930 Lone Star began a new phase in its development—expansion of its business within its own territorial boundaries through increased customer saturation and utilization. This continues to be a major policy of the company which in 1940 elected D. A. Hulcy as its second president.

Two years later, after a reorganization plan was approved by SEC, Lone Star Gas Corporation disappeared as a holding company and there emerged the Lone Star Gas Company and its wholly owned subsidiary, Lone Star Producing Company.

Today, on the threshold of still greater opportunity for leadership and service, Lone Star is expanding in virtually very department of its interconnected system.

From Jan. 1, 1946, for example, net additions to property amounted to $135,174,461, or an average of $19,310,637 per year. In 1953, a substantial portion of the budget of $28 million for expansion of physical properties will provide increased supplies and further the program of conservation pioneered by Lone Star.

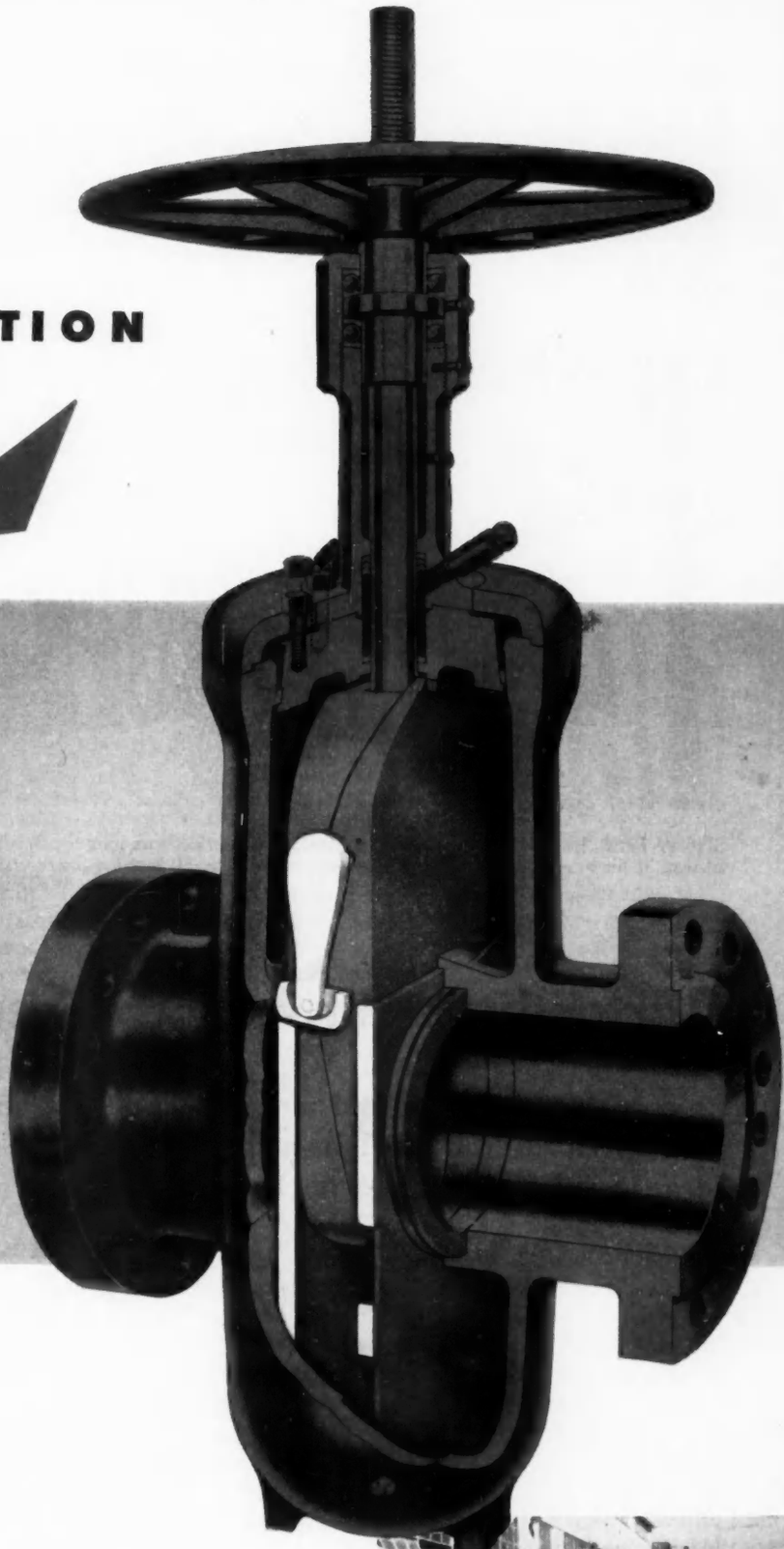
Numerous projects (costing in excess of $7,450,000) are represented in pipe lines for transporting casinghead gas from oil fields and gasoline plants and for underground storage.

It is estimated that more than one trillion cubic feet of this gas which might otherwise have been wasted, has gone into Lone Star lines since 1924 when company engineers first discovered a method for its utilization.

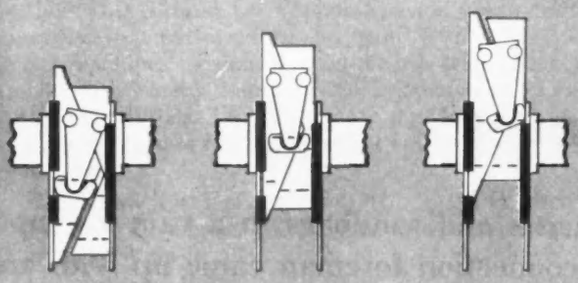
Gas reserves are a major concern in company planning today and it is interesting to note that, as of July 1 this year, company reserves under contract and connected amounted to 3.8 trillion cubic feet, one trillion more than the gas utilized by the company in its entire 44 year history!

Lone Star operations are at flood tide as transmission networks are tightened by new connecting lines and extensions and an increasing flow moves in to serve new communities along the way. And the tide is sweeping increased opportunities and a healthy financial atmosphere into the tidal area. It's quite a long way back to the tiny flow of imagination and capital represented by a few wells in Clay county and a 95-mile pipe line in 1909. And yet, 44 years is still mighty young. **—The End.**

EXCLUSIVE LEVERLOCK ASSURES POSITIVE OPERATION in W-K-M VALVES



Leverlock action guarantees that W-K-M Valves always open and close efficiently. It controls neutral position of the gate and segment while opening or closing the valve . . . permits expansion of gate assembly *only* at proper time for seating in opened or closed position . . . assures positive controlled gate and segment pressure against *both* the upstream and downstream seats.



Gate and segment in closed position. | Neutral position. | Completely open.

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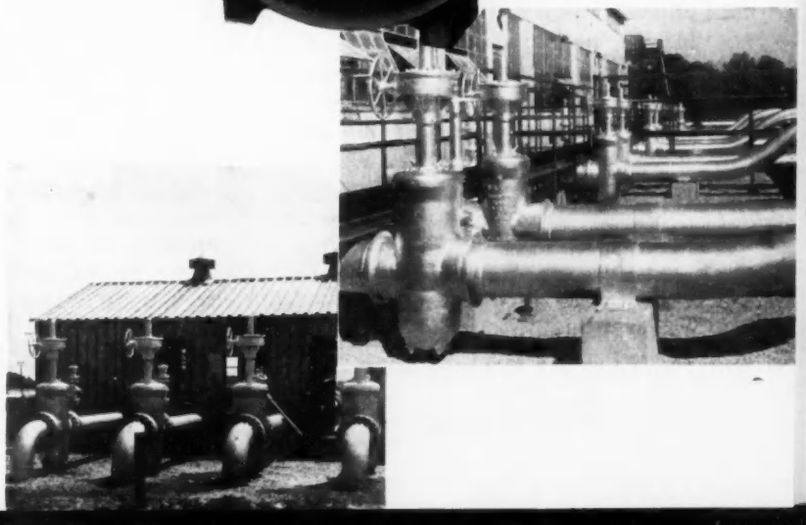

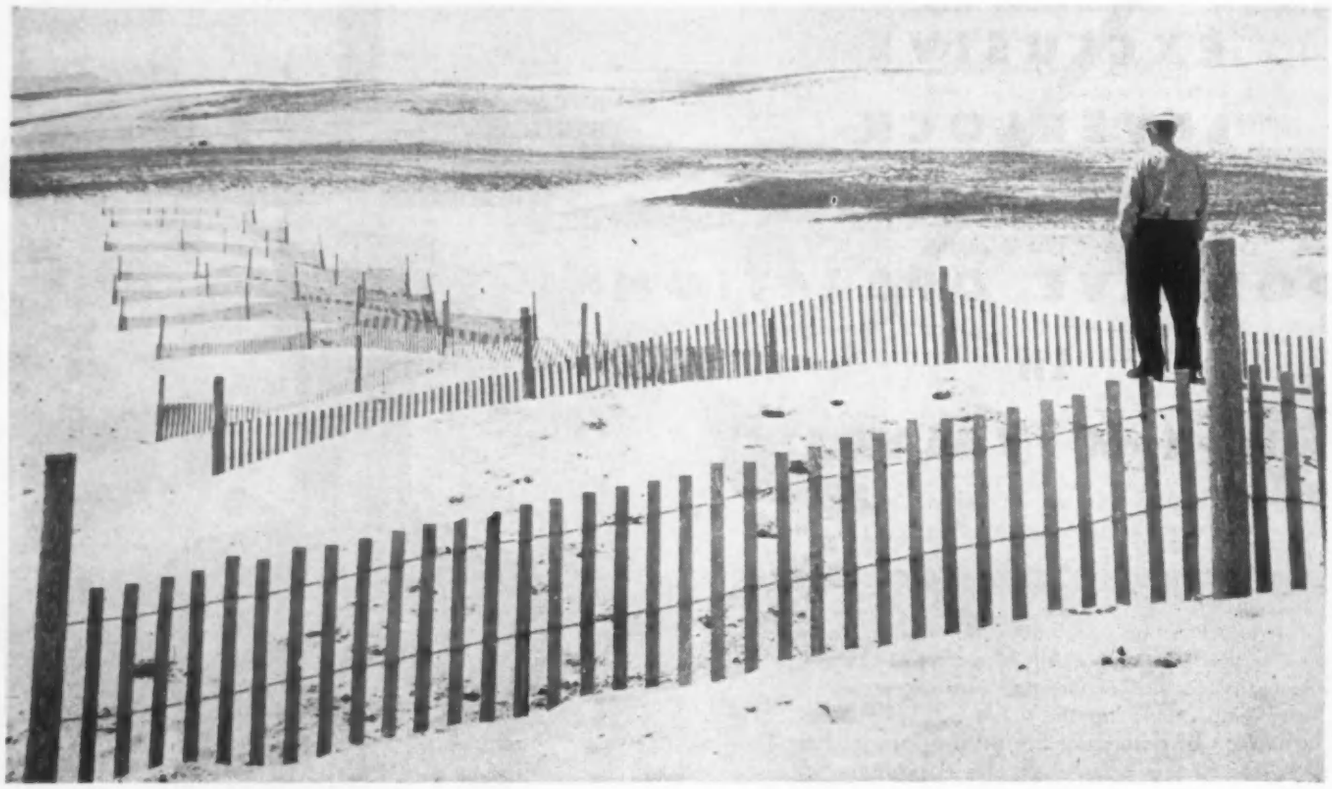

SNOW FENCES DID THE JOB. Pat Erwin, connection foreman for Service Pipe Line Company in Wyoming, looks down the right-of-way at his handiwork. All ten sections of snow fence, 50 feet long, are visible. This trouble spot is in the sand dune country of Carbon County, Wyoming.

Backfilling With Snow Fences

They tried old automobile bodies, barrels and sandbags in a vain attempt to keep backfill on an eight-inch line. Then the connection foreman came up with an idea. Use the wind and snow fences. It worked!

How do you keep a stretch of line covered if you must use sandy backfill and there is almost a constant wind? Service Pipe Line Company maintenance men had that problem on a section of their eight-inch line in Wyoming.

The company laid the line in 1948 and covered it with 20 inches of backfill. At one point in the sand dune country of Carbon County the line crosses a shallow 1000-foot valley. There the wind blows almost constantly, and nudges mountainous sand dunes across the scrubby grassland.

Shortly after the line was laid the maintenance crew began having trouble keeping the stretch across the valley covered. The winds soon ate away the sandy soil, and blew beneath the line in several places.

Seeding was useless since the sandy soil has little nourishment and moisture. And even if it had nourishment the wind would blow the seed away before it sprouted.

District Superintendent Al Munneke and Pat Erwin, the connection foreman, drove out to the site one day last fall. They found the line swinging in a couple of places. So much soil had blown away in one spot they could walk under the line without stooping.

"While driving out," Erwin explained later, "I was gazing out the window at the countryside. I saw some snow fences and the idea hit me. If snow fences make snow pile up, why wouldn't they do the same for sand?"

Erwin outlined his idea to Munneke who thought it was a good idea, and worth a try.

Because the countryside is so sandy the men could not drive a truck into the location until the ground froze. As soon as the ground crusted over they trucked in ten 50-foot sections of snow fence and a number of fence posts. They set the sections of snow fence 60 feet apart across the line and at right angles to the prevailing southwest to northeast winds.

By October the line was nearly covered with drifting sand, and Erwin estimates it will be covered by the end of the year.

The men have two other trouble spots on another line, which they feel sure can be corrected with snow fences, too.

Continued on Page 206

Announcing
Major Advance in
Tractor Design!

New Caterpillar oil-type flywheel clutch

now standard in the D8, D7 and D6!

Once again Caterpillar leads the field in an advance that boosts production, cuts down time and lowers operating costs. The new oil-type flywheel clutch, now standard in the Cat* D8, D7 and D6 Tractors, means a new high in money-making performance for you from these three rugged machines. Exhaustive on-the-job tests prove that this clutch lasts many times longer than other clutches under *identical* conditions. They also prove it enables you to run these tractors two to four times longer before making clutch adjustments.

Here's how it works. The oil system is entirely separate from that of the engine. While the engine is running, the oil pressure flows to all working parts of the clutch. Oil is fed constantly through the radial and circumferential grooves in the friction discs even when the clutch is engaged, thus cooling the friction discs and pressure plates at all times. As a result, there's minimum opportunity for wear and heating to take place. That's why adjustments are very seldom needed and disc replacement normally required no more often than engine overhauls. For easy access, the clutch has a dirt-proof housing with a big opening at the top—a mechanic doesn't have to disturb engine or transmission to get at it.

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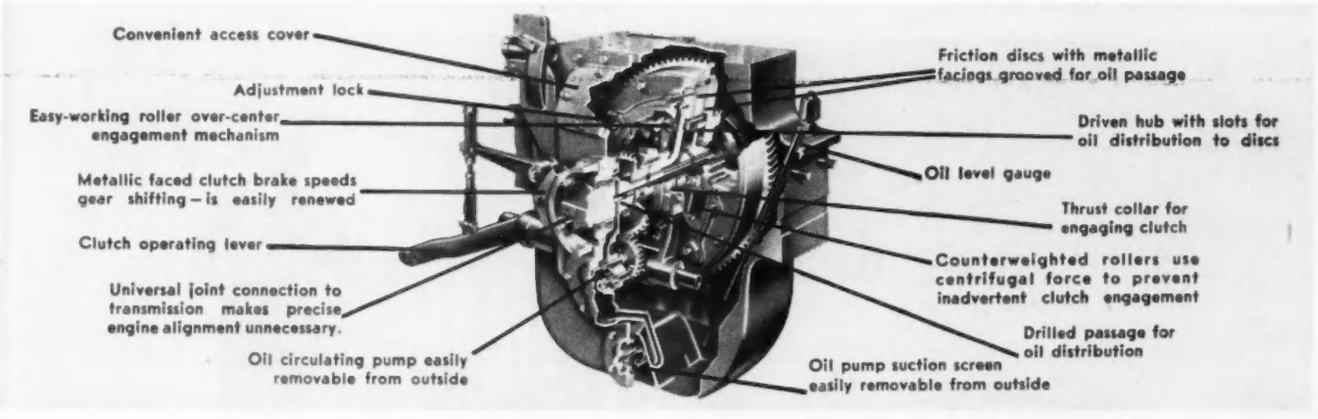
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Counterweighted rollers use centrifugal force to prevent inadvertent clutch engagement
Drilled passage for oil distribution
Oil pump suction screen easily removable from outside

New Caterpillar oil-type flywheel clutch gives you greater dependability and lower service and maintenance costs than any other clutch under identical conditions, normal or tough.

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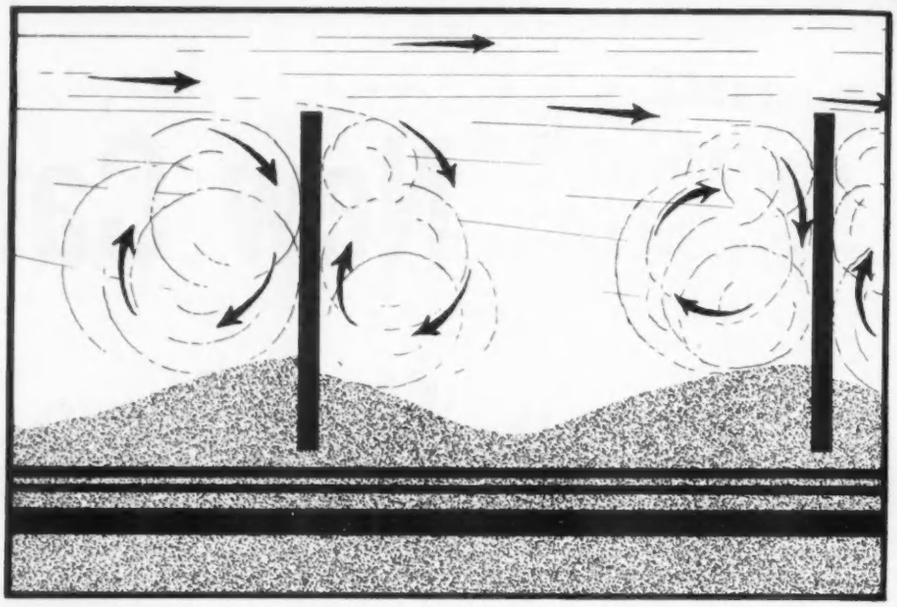
How snow fences work . . .

. . . in the sketch at the right, the two vertical black lines represent side views of two sections of snow fence, placed at right angles to the prevailing southwest to northeast winds (indicated by arrows). As the wind hits and passes over the fence a turbulence is set up and wind loses its lifting power. As lifting power is lost, sand (represented by shaded areas) is deposited. Horizontal lines represent the eight-inch line.



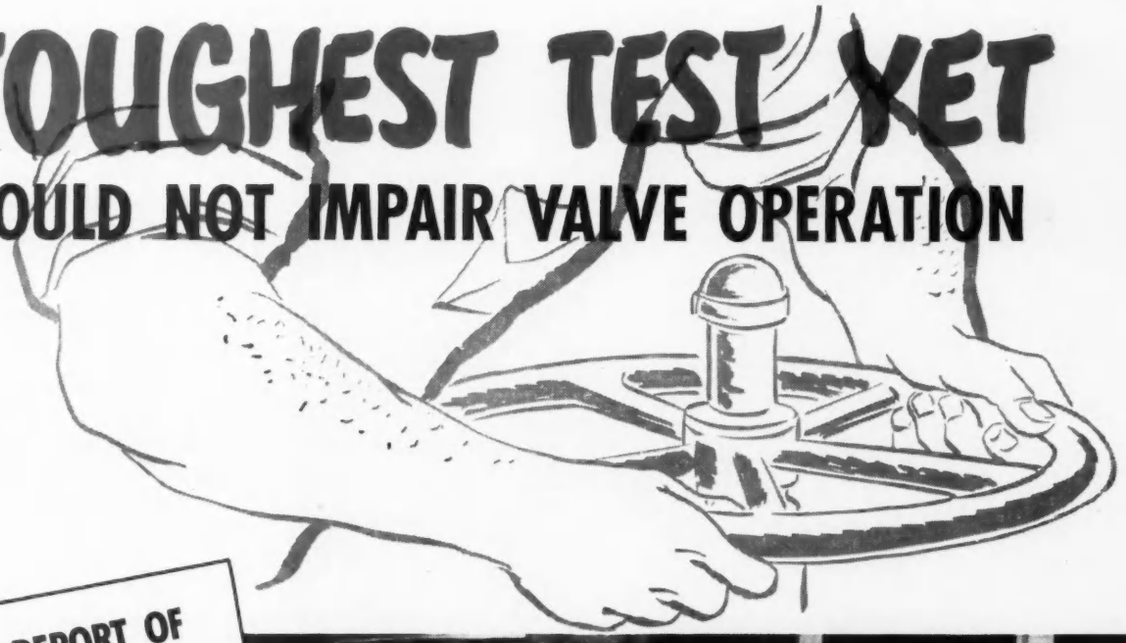
COVER-UP. Last fall Foreman Erwin walked under the line where he now stands. Drifting sand will cover line by year's end, Erwin says. This section of line is only part left uncovered. Seven hundred feet was exposed last fall.

JUNK FAILED. Junk of all kinds was used in an attempt to hold the sandy soil over the line. Some of junk is still visible. It soon will be covered by sand, too. Beyond are sections of snow fence, placed at right angles to line.

PILED HIGH. This side view shows how high the snow fence has caused the sand to drift over line. As sand piles up, snow fence will be raised.

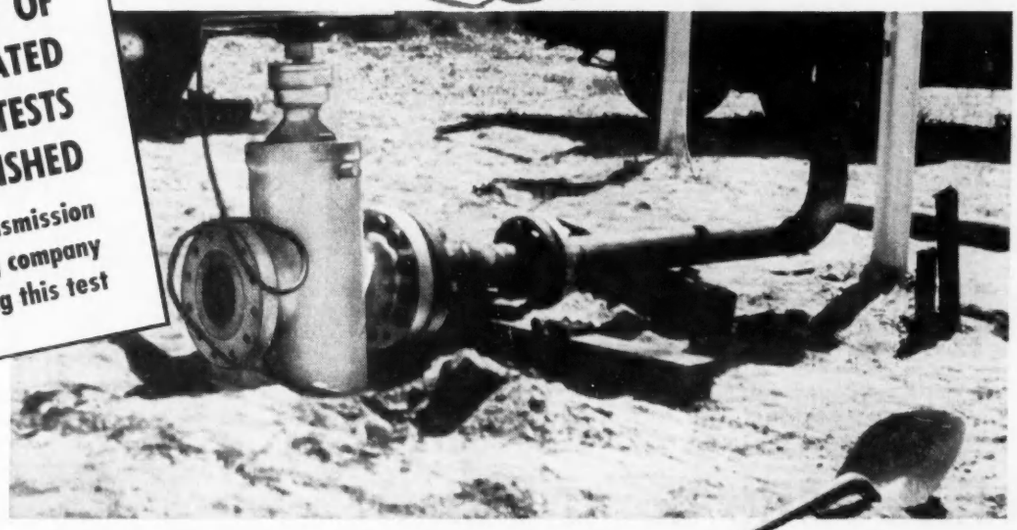
CLOSE-UP VIEW. This photo shows a close shot of snow fence, a series of lathes wired together. Lathes are five feet tall. Sections are 60 feet apart. —**The End**

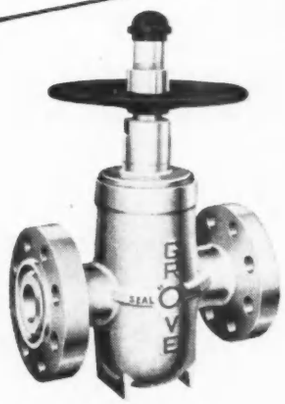
TOUGHEST TEST YET
COULD NOT IMPAIR VALVE OPERATION



A FULL REPORT OF ACCELERATED LIFE TESTS WILL BE FURNISHED

—by major gas transmission and producing company conducting this test





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Available through leading oil field supply stores.

SAND, GRAVEL, WELDING SLAG, STEEL CUTTINGS LOADED INTO VALVE CONDUIT—YET BUBBLE TIGHT SEAL MAINTAINED

Just imagine loading the conduit of a 6" valve, swabbed with an excess of motor oil, *first*, with several shovels full of sand and rock from pea size to ¾" irregular shapes. The valve was forced through the debris into closed position. When 695 psig line pressure was turned into the valve, absolute seal was effected. Then, the valve was opened and the trapped volume of gas, rocks and sand was released to atmosphere. *Next*, the conduit was loaded with welding slag and sharp pieces of pipe metal cut by a torch, and again the valve was closed and pressure applied. After a period of throttling, the valve was bled to atmosphere, clearing out the slag and scrap metal. *Finally*, the valve was again closed and held *absolutely bubble tight*. Final inspection showed no damage that would impair continued service, or prevent smooth, effortless operation.

For complete test data, write for name of major gas company. S-308

GROVE SEAL-"O"-RING Gate Valves

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1 **WELDING** with plastic cement. First, a clear, solvent liquid is applied to pipe and inner surface of slip-sleeve coupling with a paint brush. Then the solvent cement is applied and the pipe is joined.

Nine-Mile Long Plastic Pipe Line Is Completed

Williston Basin line is the longest of its kind on record.

THE FIRST cross-country pipe line entirely of plastic has been completed at Poplar, Mont. It is in service delivering crude oil from a producing field in the Williston Basin to a shipping point on the Great Northern Railway. More than nine miles in length, the plastic line is the longest of its kind on record.

The pipe used in this line is 3-inch inside diameter with a wall thickness of 0.125 inches and was produced of butyrate plastic by the extrusion process. Designed to operate at a maximum pressure of 90 pounds per square inch at a temperature of 60° F., the line is planned to deliver 2500 barrels of crude oil per day, with facilities for increasing the capacity in the future.

Location of the crude oil storage tank battery from which the pipe line runs is on the Huber Lease within the Fort Peck Indian Reservation. The elevation of the tank battery is 2090 feet above sea level. The railroad siding where the pipe line ends is 1940 feet above sea level. This drop of 150 feet would provide a natural gravity flow. However, between the storage and tank battery the line crosses a spot where the elevation is 2100 feet.

In order to maintain a flow of 2500 barrels per day as desired, three booster pumps, each capable of pumping against a head of 78 psi, were installed. One pump is at the head of the line, a second is 13,750 feet from pump Number 1, and a third approximately 17,900 feet downstream from pump Number 2. Capacity of the line can be varied by operating only one or two pumps. The line is capable of flowing at a reduced rate in the event one pump is down for repairs.

Important considerations in the choice of plastic pipe for the line were its high resistance to corrosion, apparent freedom from paraffin clogging, and low cost installation. The crude oil to be delivered through the line is rated 40.1 API. It is a paraffin-base oil containing corrosive sulphuric gas.

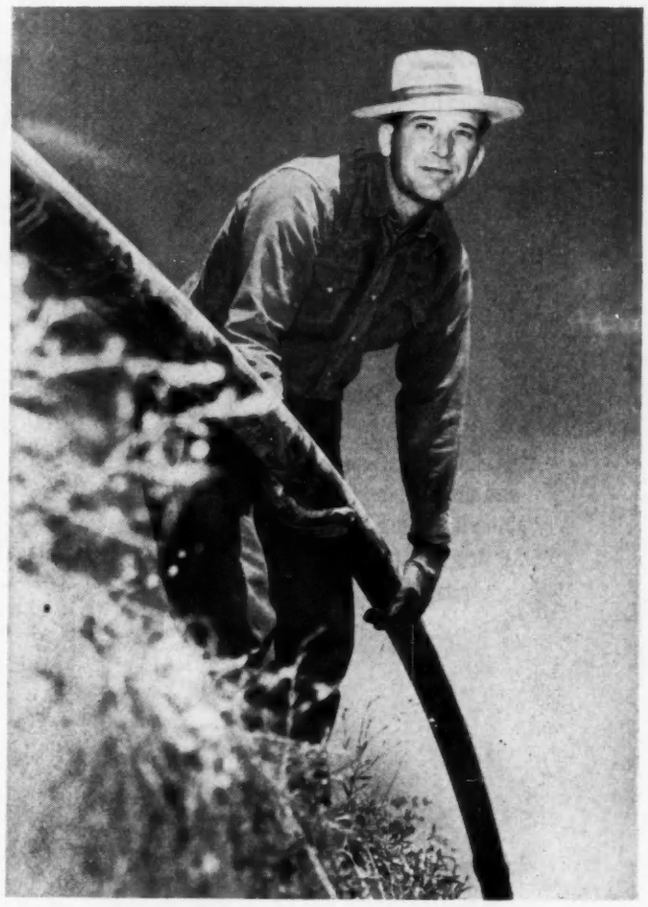
Total labor used on the installation of the pipe line—including ditching, laying, and covering—was only six men. There was practically no weight problem in hauling the pipe. In a timed operation four men loaded 5000 feet of the 3-inch pipe on a trailer in 15 minutes. It took only ten minutes to drop off the 5000 feet of pipe, in bundles of six 20-foot lengths each, at spaced intervals alongside the ditch prior to joining it together. Twelve revolutions of one marked tire wheel was the measure for dropping each bundle of pipe.

The pipe was joined together on the ditch bank in a continuous length and then lowered by one man into the ditch. It was "snaked" in the ditch so that the pipe touched the opposite sides of the ditch about every 200 feet. This was done to allow for contraction and expansion due to any temperature changes that may occur. Because of the depth of the frost line in northeastern Montana, the ditch was dug about 5 feet 4 inches deep. This would assure maximum flow of oil during the winter months. The ditching was accomplished by a conventional rotary ditchdigger with a ditching speed of about 800 to 1000 feet per hour. A blade-type earthmover was used to cover the pipe.

The pipe line is owned by Plastic Service Lines, Inc., Denver, Colo.

Continued on next page

2 **STRINGING.** Boxes contain six joints of 20-foot pipe. Each box weighs 80 pounds.



3 **LOWERING-IN.** One man lowered in the entire line. Ditch is 5 feet, 4 inches deep.

4 **TIE-IN.** Flange-type adapter changes from plastic to steel near the tank battery.

5 **BACK-FILL.** Ditch was back-filled in a short time by an ordinary grader.

HERE'S MORE POWER TO YOU ...AT LOWER OVER-ALL COST

Continental Red Seal Closed Power Unit operating on natural gas and driving pipe line gathering pump of the Service Pipe Line Co., Ada, Okla.

The equipment builder who powers his product with Continental Red Seal engine – and the user of such equipment – both benefit from specialized experience that goes back a long, long time. They profit by engineering features, and advances in production technique, evolved over a period of more than 50 years. Ever since 1902, Continental dependability, economy and stamina have been building prestige for quality leaders in the transportation, farm and industrial equipment fields – in oil field producing, distribution, processing . . . providing more and better power, at lower over-all cost.

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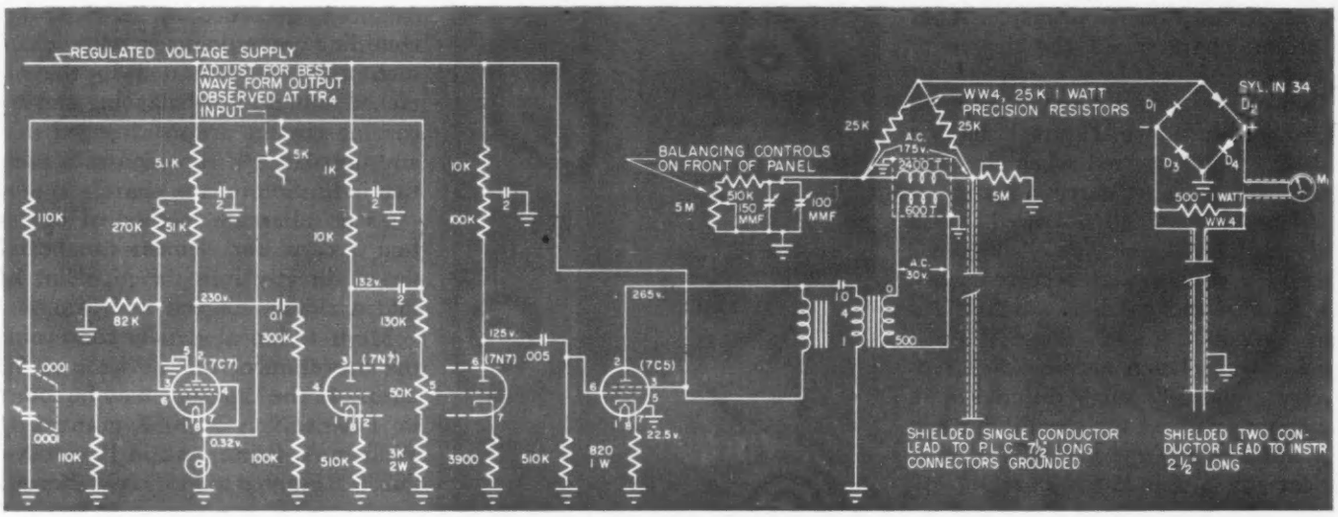
910 S. BOSTON ST., ROOM 1008, TULSA, OKLA. • 1252 OAKLEIGH DRIVE, EAST POINT (ATLANTA) GA.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SYL. IN 34
SHIELDED SINGLE CONDUCTOR LEAD TO P.L.C. 7½ LONG CONNECTORS GROUNDED
SHIELDED TWO CONDUCTOR LEAD TO INSTR 2½ LONG

New Device Determines Batch Cut Point

This always has been a problem in pipe line batching. But this device does the job accurately and automatically by detecting the change in the dielectric properties of the pipe line fluids as the interface between batches moves down the line.

By DR. W. A. BRUCE, The Carter Oil Company, Tulsa

A NEW DEVICE for use in the detection of the zone of separation between successive batches of crude oil or products in pipe lines has been developed by the Research Laboratory of The Carter Oil Company, Tulsa. This device operates by detecting the change in the dielectric properties of the pipe line fluids as the interface between batches moves down the line. It is used to aid in the determination of when to cut the stream so that there will be a minimum amount of contamination between two successive batches.

This cut point device has been tested on two crude oil lines each carrying a variety of crudes. It has also been used on two of the large products lines, each of which carries a variety of refined products.

The Carter instrument operates on

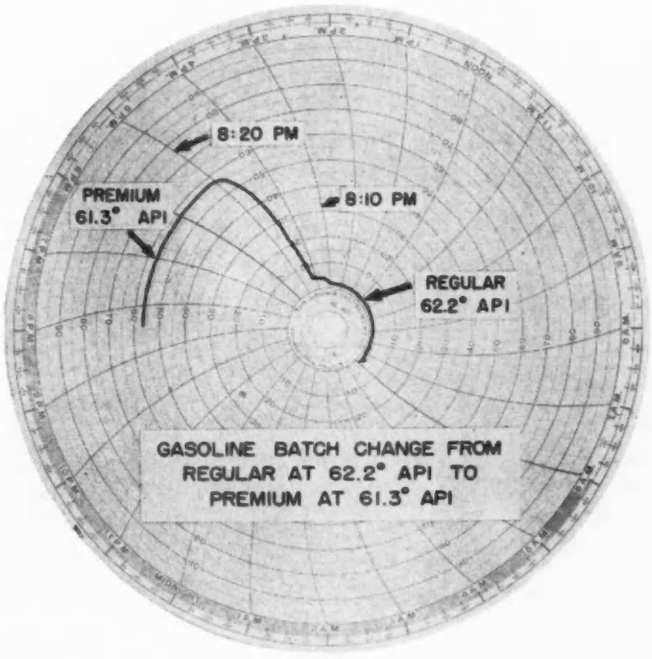


FIGURE 1.

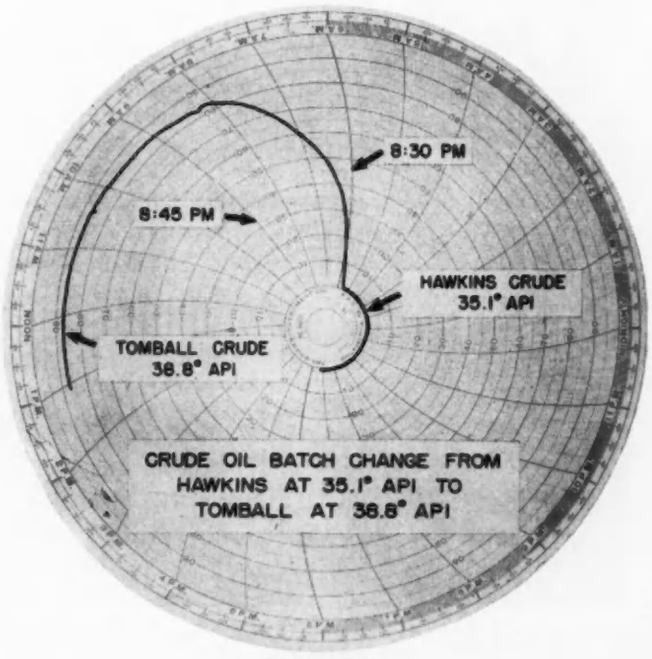
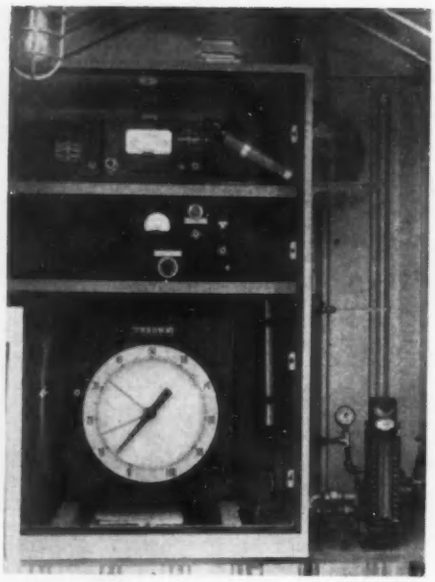

8:30 PM
8:45 PM
HAWKINS CRUDE 35.1° API
TOMBALL CRUDE 38.8° API
CRUDE OIL BATCH CHANGE FROM HAWKINS AT 35.1° API TO TOMBALL AT 38.8° API

FIGURE 2.

a capacitance bridge principle. A recording chart shows the degree of unbalance caused by a batch change. Two of the charts obtained in batch changes are shown. Figure 1 shows a change that occurred when the pipe line was used to carry a batch of Tomball crude oil followed by a batch of Hawkins crude oil. Figure 2 shows a change that occurred when a house brand gasoline was followed by premium grade. These illustrations were chosen because they represent relatively small differences in materials and yet the chart indication is sufficiently large to make it quite clear when the batch change took place.

How Instrument Operates. Differences in the dielectric properties of different crude oils or products form the basis for the operation of this device. While these differences are fairly small the methods of measurement of these changes in dielectric properties are sufficiently sensitive to make it possible to detect very small differences in the oils. In using this principle to detect the cut point between batches, fluid from the pipe line is put through an electrical capacitor which forms one arm of a capacitance-resistance bridge.



NEW DEVICE developed by Research Laboratory of The Carter Oil Company for detecting zone of separation between successive batches of crude or products in pipe lines.

In operation the instrument is balanced either manually or automatically while the fluid from the first batch is in the electrical capacitor. As the fluid from the second batch enters the capacitor the bridge circuit becomes unbalanced. The degree of unbalance is recorded by an electronic recording potentiometer on a chart such as those indicated in the attached figures. The balancing and recording circuits are so arranged that any unbalance is recorded as a positive indication on the chart.

As an alternate method of operation a capacitor element can be inserted directly into the pipe line or into a closely coupled side arm.

More technical details concerning the operation of this device and the nature of the capacitor may be found in Patent No. 2654067 granted to William A. Bruce, and in Patent No. 2623928 granted to Francis M. Bower.

Batch Changes Between Different Crudes. The Carter batch change detector has been tested extensively on two crude oil lines. A variety of crude oil interfaces have been observed. In all cases where there was any detectable difference in gravity the batch change was quite noticeable on the cut point indicator. Some difficulty was experienced in one instance in which the variations of the crude oil from one source were greater than variations between two successive batches. Also, the instrument showed brief unbalance when

CUT POINT BATCH INDICATOR being tested by Midwest Research Institute, Kansas City, Mo., for Great Lakes Pipe Line Company. Forty batch changes were made twith 40 successful indications and no failures. Installation shown is about 30 miles from Kansas City on Great Lakes Pipe Line system.

slugs of BS&W were passing through. After a period of experience it was obvious to the operator when either of these anomalies was being observed.

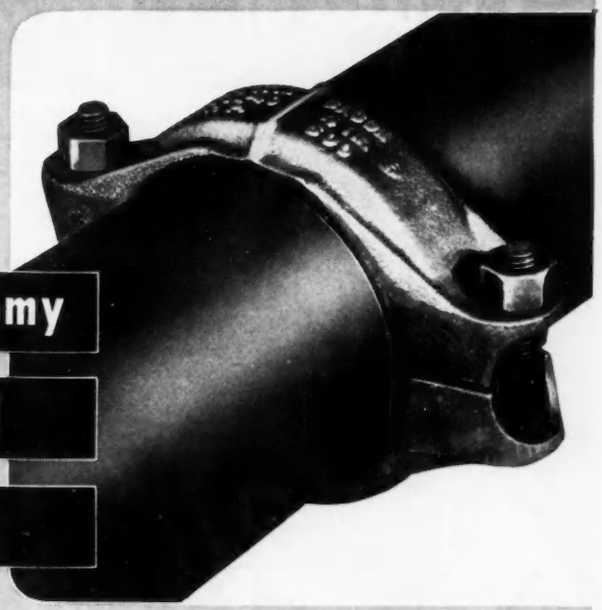
Batch Changes of Products. Because of the homogeneity of products the indication of batch changes between products are usually sharper and more clear-cut than between crude oils. For this reason a change in products of a few tenths degree API or simply in different blending stocks can be detected. The cut point instrument was used successfully to detect such batch changes on two large products lines handling a wide variety of different refined products from different companies. In one case a cut point between two different house brand gasolines having practically the same gravity was detected. Numerous cut points were detected that had the same character as indicated in Figure 2. In this case the cut point was between regular gasoline having an API gravity of 62.2 followed by premium grade gasoline-having API gravity 61.3.

In both crude oil and products lines the main part of the batch change occurred in a relatively short time. For example, the chart showing the cut point between regular and premium gasoline indicated that the major part of the contamination between the two batches lasted only two and one-half minutes. The total time necessary for the complete batch change was about ten minutes.

Tracer Slug. The possibility that this instrument would not be sensitive enough to detect the difference between all batch changes has been considered. However, experience with the instrument on the line should make it clear which batches are so similar that their separation point cannot be detected. If it is necessary to separate these materials a very small slug of different crude oil or refined product can be introduced as a "tracer" in most cases.

Remote Signal. The simplicity of the bridge circuit and recording device makes it possible to locate the electronic part of the cut point detector at a remote point from the pipe line. It is also possible to locate at one or more remote points a signalling device that will indicate when a batch change has started. —**The End**

Now! Couple grooved pipe with



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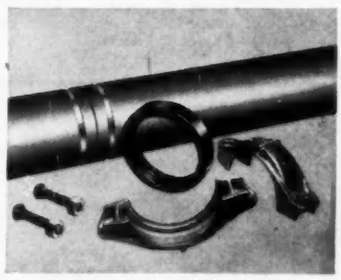
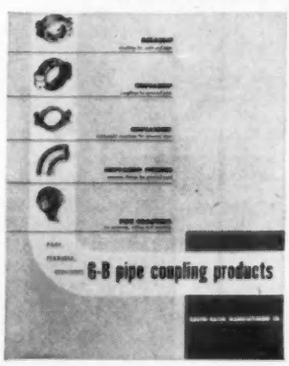
lightweight couplings for grooved pipe

GRUVAJOINTS — for grooved pipe systems carrying pressures up to 500 psi — cost considerably less than ordinary grooved pipe couplings. You get substantial freight savings, too, because **GRUVAJOINTS** weigh up to 45% less than conventional couplings.



Light and trim, **GRUVAJOINTS** are easy to apply and remove; easy to store; can be used over and over. They are made of malleable iron for 2", 3" and 4" pipe — protected with green rust inhibitor.

The **GRUVAJOINT** sealing gasket is interchangeable with those in **GRUVAGRIPS** (standard weight grooved pipe couplings). **GRUVAJOINTS** couple perfectly with **GRUVAGRIP FITTINGS.**



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Write today for illustrated folder describing **GRUVAJOINTS** and other G-B pipe coupling products — **GRUVAGRIPS, GRUVAGRIP FITTINGS** and **ROLAGRIPS** (for plain end pipe). Ask for folder CCF.

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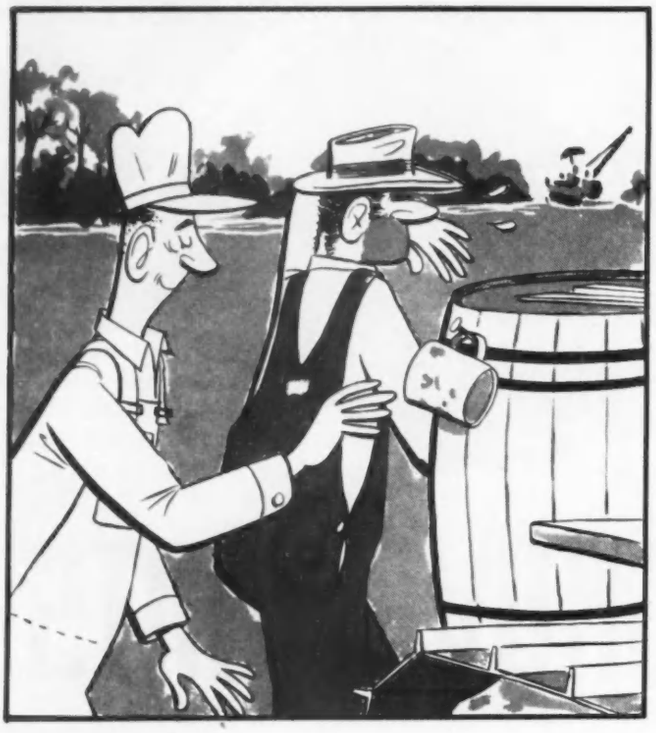
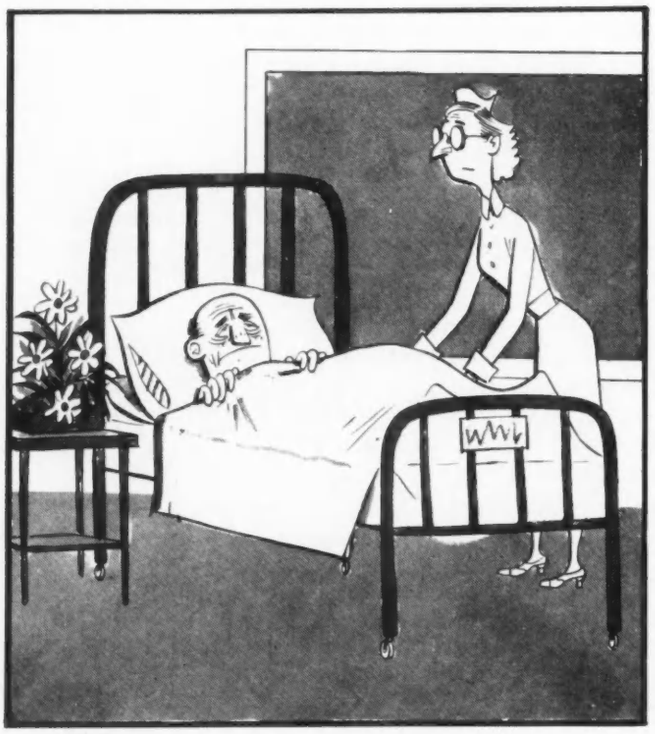
Perils of Pipeline Pete



Public drinking cup . . .

. . . Wuup!

He was showing young men how . . .



. . . He's out of service now!

CONSTRUCTION AREA

EL PASO NATURAL GAS COMPANY IS BUILDING A NEW PIPELINE FROM PERMIAN BASIN OF WESTERN TEXAS TO BRING MORE GAS TO ARIZONA AND CALIFORNIA USERS. AIDING IN ITS COMPLETION IS DEPENDABLE DELIVERY OF BASALT-KAISER STEEL LINE PIPE.

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Continuous Weld—Plain End	2⅜" to 4½" O.D.	Up to 40'	Standard	Fontana, Calif.
Electric Resistance and Fusion Weld—Plain End	14" to 18" O.D.	Up to 40'	.250" to .500"	Napa, Calif.—Basalt-Kaiser
Electric Resistance Weld—Plain End	5⅛" to 12¾" O.D.	Up to 55'	.188" to .375"	Fontana, Calif.
Electric Fusion Weld—Expanded—Plain End	20" to 30" O.D.	Up to 40'	.250" to .500"	Napa, Calif.—Basalt-Kaiser

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How to do it

PIPE LINE HINTS

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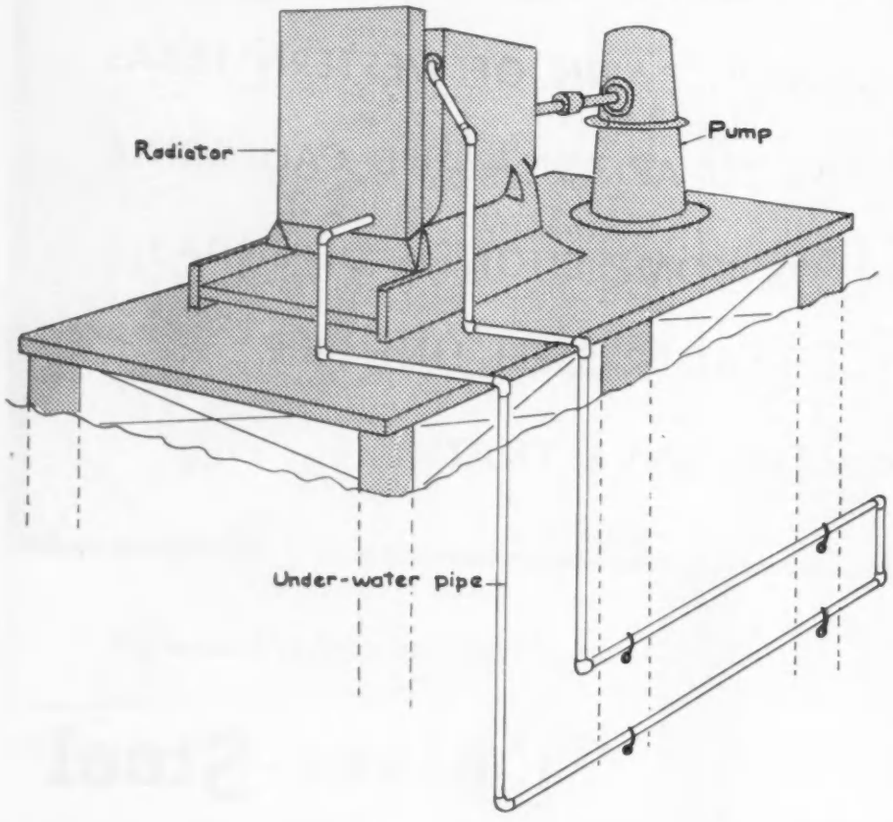


Pipes Submerged in Sea Water Cool Engine

Substitute a small tank and forty feet or so of two-inch copper pipe for the radiator, fan and fan belt to cut maintenance needs for a pump engine on an off-shore installation.

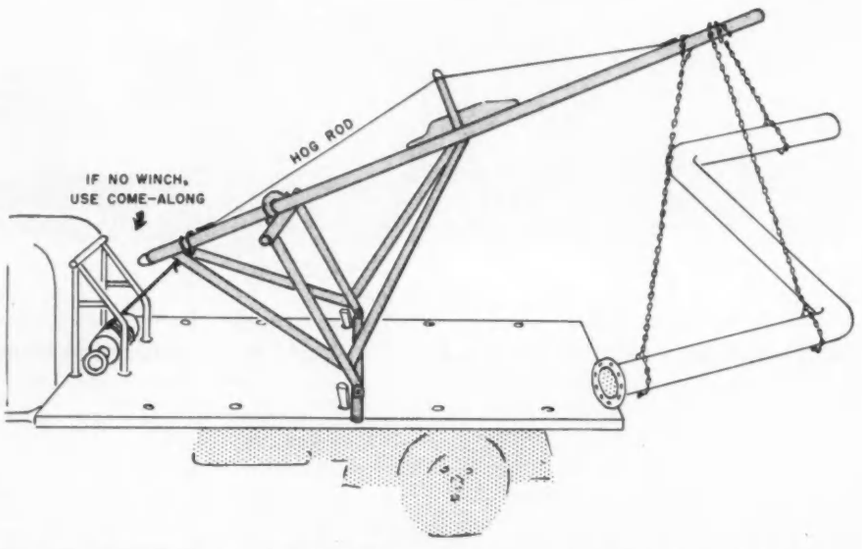
Very often off-shore installations are unattended most of the time. The pumper starts the engine and leaves it running, depending on instruments to shut it down after a specified period. Thus, for many hours at a time, the engine is left entirely on its own; and, for this reason, the fewer maintenance problems connected with the engine the better.

To affect this change which minimizes some of the maintenance problems, remove the radiator and substitute a copper tank which has the same over-all dimensions of the radiator itself. The tank should be sized to fit the brackets and yoke which ordinarily support the radiator. Remove the fan and fan belt and then pipe cooling water from the radiator to a loop of pipe, submerged well below the minimum low tide, and then back to the engine. This pipe, which is submerged in water, serves as a heat exchanger for the hot engine jacket water. The length of the loop beneath the surface of the water depends upon the amount of cooling required; the larger the engine the greater amount of cooling surface is needed. The thermostat in the system should be retained as a means of controlling temperature.

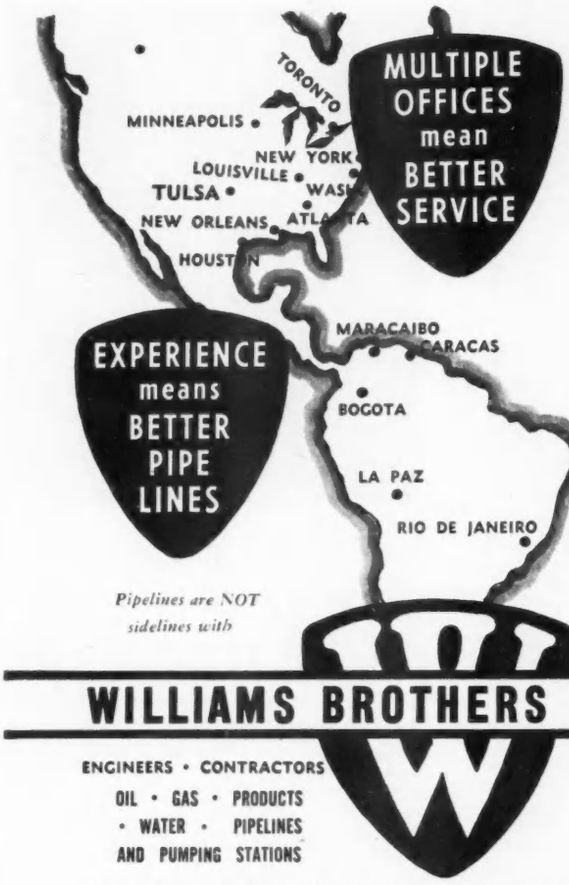
Demountable Rocker Boom Picks Up Heavy Loads

Turn an ordinary flat-bed truck into the equivalent of a gin-pole truck with an easy-to-make rocker boom that will pick up loads almost as heavy as those handled by gin poles. The cost is little; the advantages are many.

As a rule, flat-bed trucks suffice for station maintenance forces. They are adequate for transporting men and light materials about the station yard, and hauling parts from the depot. Yet on occasions, there are loads too heavy for men to handle, and loading equipment is not at hand. This is when the rocker boom, shown above, comes in handy.



The boom assembly is demountable —not a part of the truck. To install it on the truck, it is necessary only to drive two body stakes in place as shown, lift the boom onto the truck.



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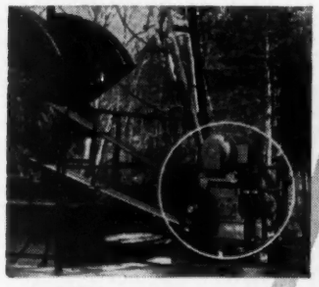

Typical oil field installation on single reduction pumping unit pumping 10, 13, 16 and 19 SPM.

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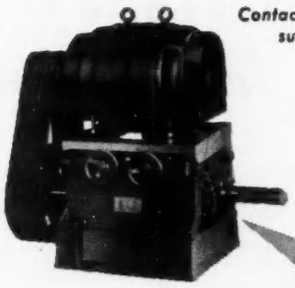


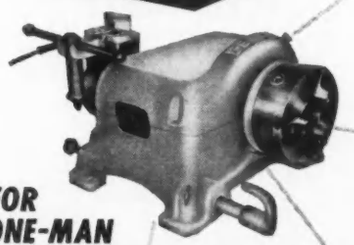
Contact your local oil equipment supply store or write:

TURNER UNI-DRIVE Company

3418 Terrace Street Kansas City 8, Missouri

Introducing the **NEW BEAVER** Lightweight Aluminum Model-D Power Drive $202.50

Beaver No. 102 — P D Wide Roll Pipe Cutter made especially for power drives.



Beaver Model 77-Drive Threader is ideal for use with new Model-D.

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- Side openings give motor ventilation and act as hand grips for moving!
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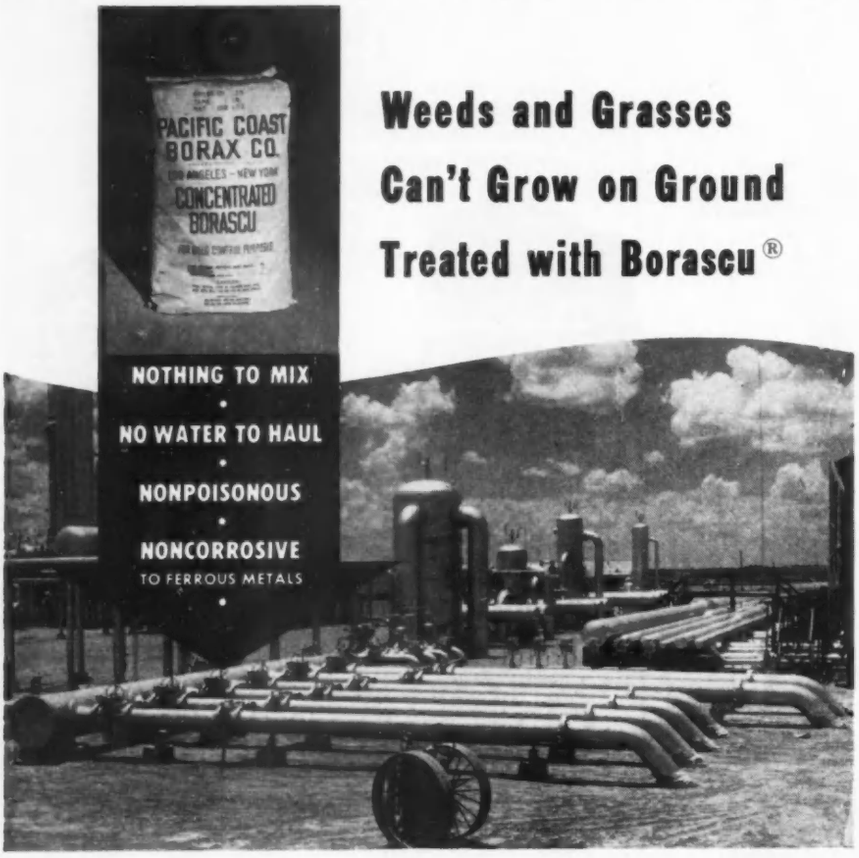
Then hook the short end of the pole to a winch if the truck is equipped with one. A "come-along" or coffin hoist will serve almost as well as a winch.

The design of the boom assembly varies according to size of truck and weight of the loads to be lifted. For a 2½-ton truck the long pole should be made of four-inch pipe, with a framework of three-inch pipe. A strong-back of half-inch steel plate and a hog rod brace running from end to end of the pole gives it added strength.

Care should be taken to make the pivots strong enough to keep from shearing. One way to do this is to weld small diameter pipe sleeves into the pipe for the heavy bolts that attach the boom to the bottom plate which rests on the truck bed. Heavy steel clips support the assembly.

Of course, if the bottom member of the assembly is made of heavy pipe, it will roll against the body stakes as the boom pivots.



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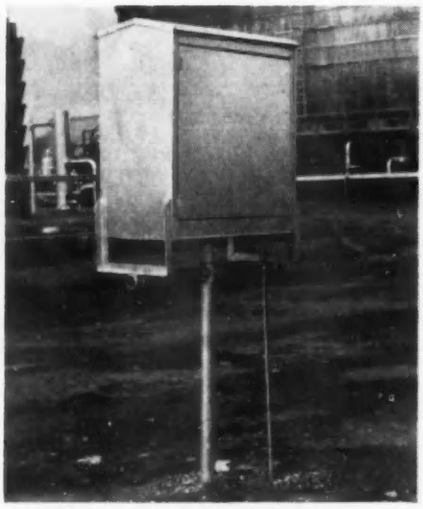

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The case is made of lightweight metal with a hinged door and a pitched roof. It has a framework of angle iron and is mounted on an angle iron bracket.

This cabinet is supported independently of the instrument by two branch pipes coming out of the main stand. They are screwed in to a four-way tee which is a part of the instrument stand. In addition to protecting the instruments, the case has a neat appearance.

Arrange Welding Material On Truck for Efficient Use

Here is a neat arrangement of welding machines, oxygen and acetylene bottles and cutting and burning equipment for a welder's utility truck.

It includes spools for not only the welding leads, but also for the oxygen and acetylene hose. Note that the oxy-

gen and acetylene bottles themselves are mounted on brackets which can easily be taken off the truck for refilling or replacing.

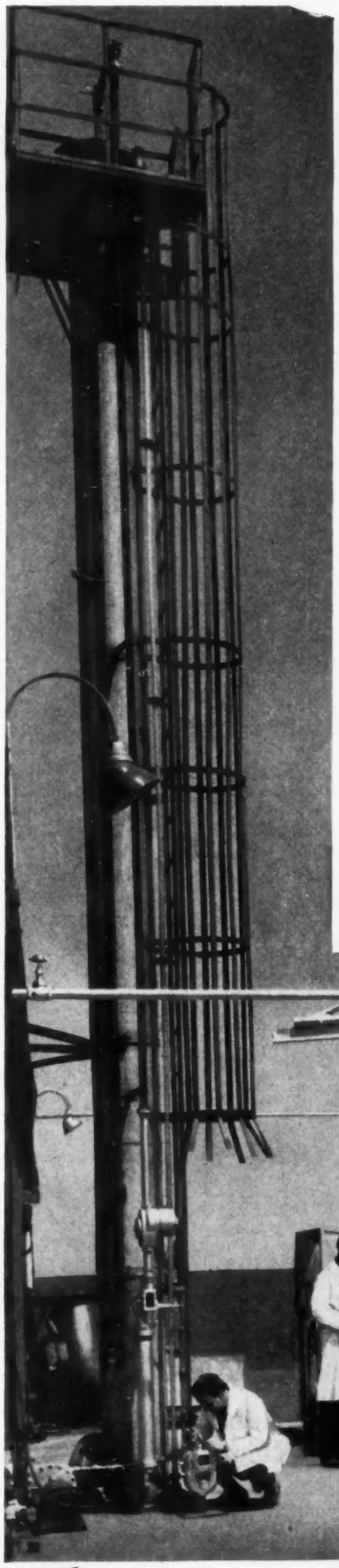
When the truck goes up the right-of-way, the spools are on the left side handy for immediate use. These spools are made of light metal plate welded onto an angle iron frame. Sharp edges are beveled off so that the edges will not cut the rubber hose and welding leads as they are spooled on or off the reel. These spools are attached to the brackets which support the oxygen and acetylene bottles.

Add Ramp to Trailer For Loading Equipment

An oil field ramp can be added to a low-bed trailer to facilitate the loading of tractors, ditching machines and other heavy equipment. This ramp shown above makes loading and unloading of equipment a simple matter and requires no additional men besides the drivers.

The end of the trailer is mitered as shown so that the ramp will drop to the proper angle when it is needed. When the ramp is not in use, it folds up over the trailer upon to the trailer out of the way. Note that the ramp hinges at the tail of the low-bed trailer and there are four heavy structural beams reaching down to the six-inch pipe which forms the base of the loading ramp. Recessed behind the ramp proper there is an angle iron frame which carries two additional ramps. Note that the workman above is pulling one of these ramps out onto the ground. These additional ramps have recesses which fit the six-inch pipe at the bottom of the ramp.

The cross members of the ramp are made up of two-inch pipe reinforced with heavy steel plate.



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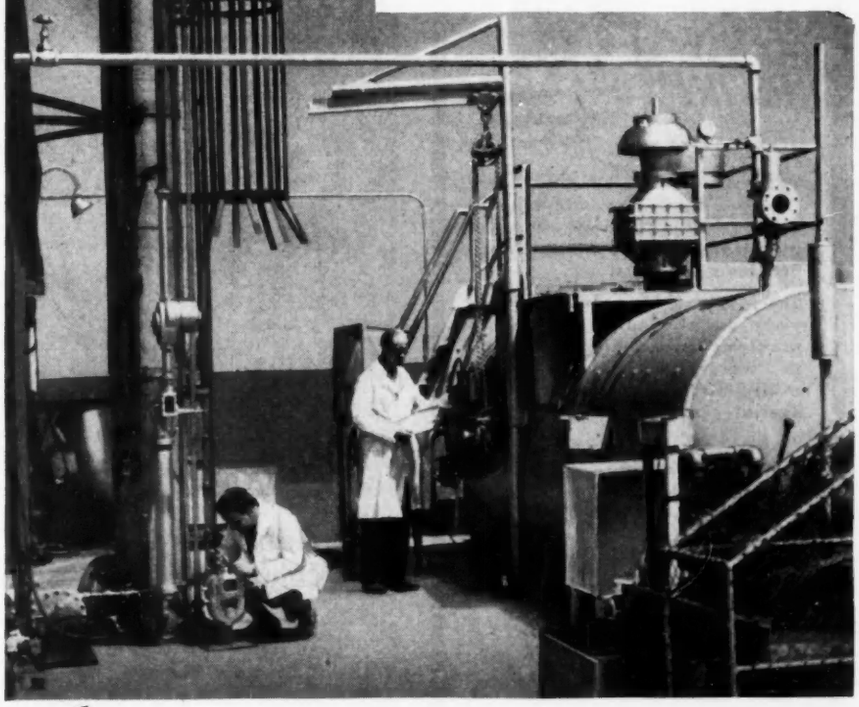

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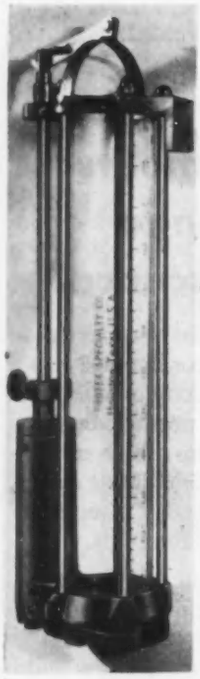

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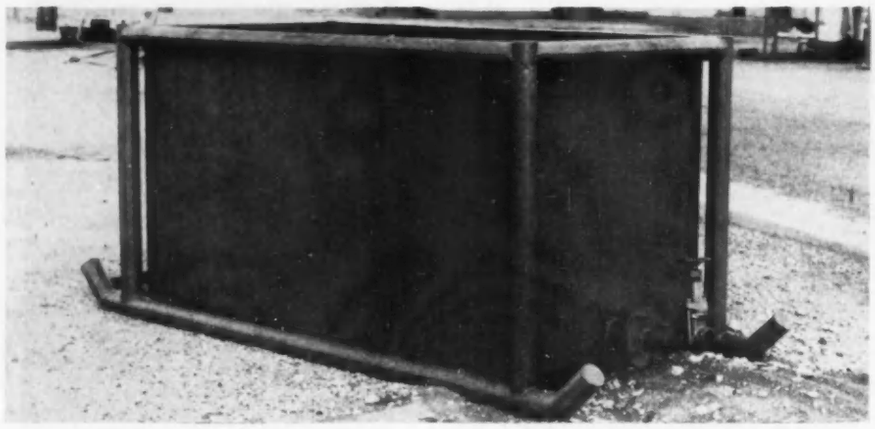

Skid-Mounted Slop Oil Tank Is Easily Transported

Here is a skid-mounted slop oil tank which can be towed about in compressor or pump station handily.

The tank itself is made of quarter-inch steel plate welded into a rectangular box as shown. It is mounted on a pipe frame which protects it and gives it rigidity. Note that the bottom of the tank is flanged for the drain valve.

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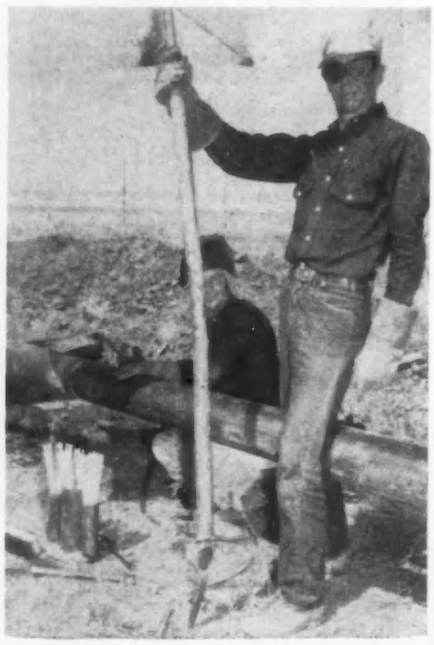

Pick Head Makes Anchor For Welder's Umbrella Stand

The head of an old pick makes an excellent anchor for a welder's umbrella stand. As shown here, simply drive the umbrella stand itself over the pick head and then tack-weld it in place.

In order to stand the umbrella upright, jab the pick into the ground.

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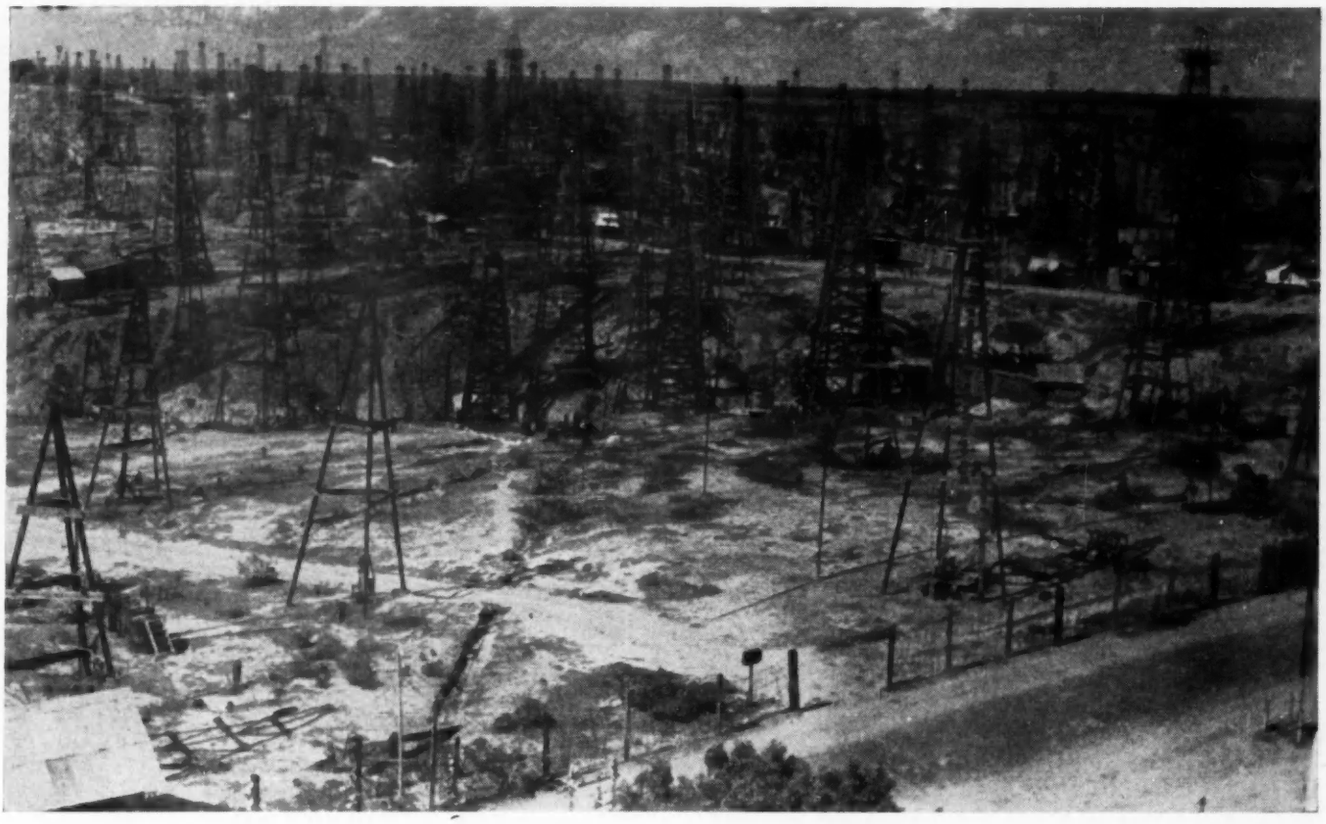


1 Side by side in this field stand these monuments to the old and new methods of drilling for oil in Burma. The hand-dug wells (foreground) and the more modern type in the background both played their parts. The climax was reached when Yenangyaung field, at its peak, became the largest producing field in Burma. This photograph gives an idea of the congestion which followed the granting of authority for the hand-dug well owners to lease their sites to commercial enterprise to develop.

Burma's Hand-Dug Oil Wells

A contrast between the old and the new . . . an industry that's dirty, dangerous and dying.

By H. E. KING

THE HAND-DUG WELLS of Burma are linked irrevocably with ancient Burmese legends which trace oil's existence right back to the days of "Once upon a time." These legends have been dramatized throughout Burma's history in theaters. They have told of the strange fluid found at Yenangyaung—fluid which had magical powers. These legends and existence of hand-dug wells have doubtless served as useful guides, in pre-seismic days in the discovery of oil in Burma.

From earliest times and until the annexation of Upper Burma in 1885, sole rights for oil production were vested in a Corporation of 24 Hereditary Members. Title and rights of membership were acquired in strict accordance with primogeniture descent. Men and women hold equal privileges. Families of members of the Corporation alone were permitted to dig for oil.

They were required to obtain sanction from the head of the family who was, in turn, obliged to request approval from the corporation president before work could begin.

Allocation of well sites was to play an important part in later development of the Twingone and Beme fields, which were divided into concessions spaced 60 feet apart. This spacing was too close to serve the best interests of commercial exploitation, but it was found satisfactory by the Burmese system with its low production from shallow wells.

The shallow sands in a large area of the field were protected from the hand-dug well worker by a heavy water sand which the Burmese could not penetrate. Consequently, when permission to lease drilling sites was granted, owners were glad to have their holdings developed. And private enterprise was anxious to acquire drilling rights.

Under keen competitive drilling and 60-foot spacing, occasionally one drilling crew would drill into a neighbor's well and, on cementing, would freeze the latter's production string.

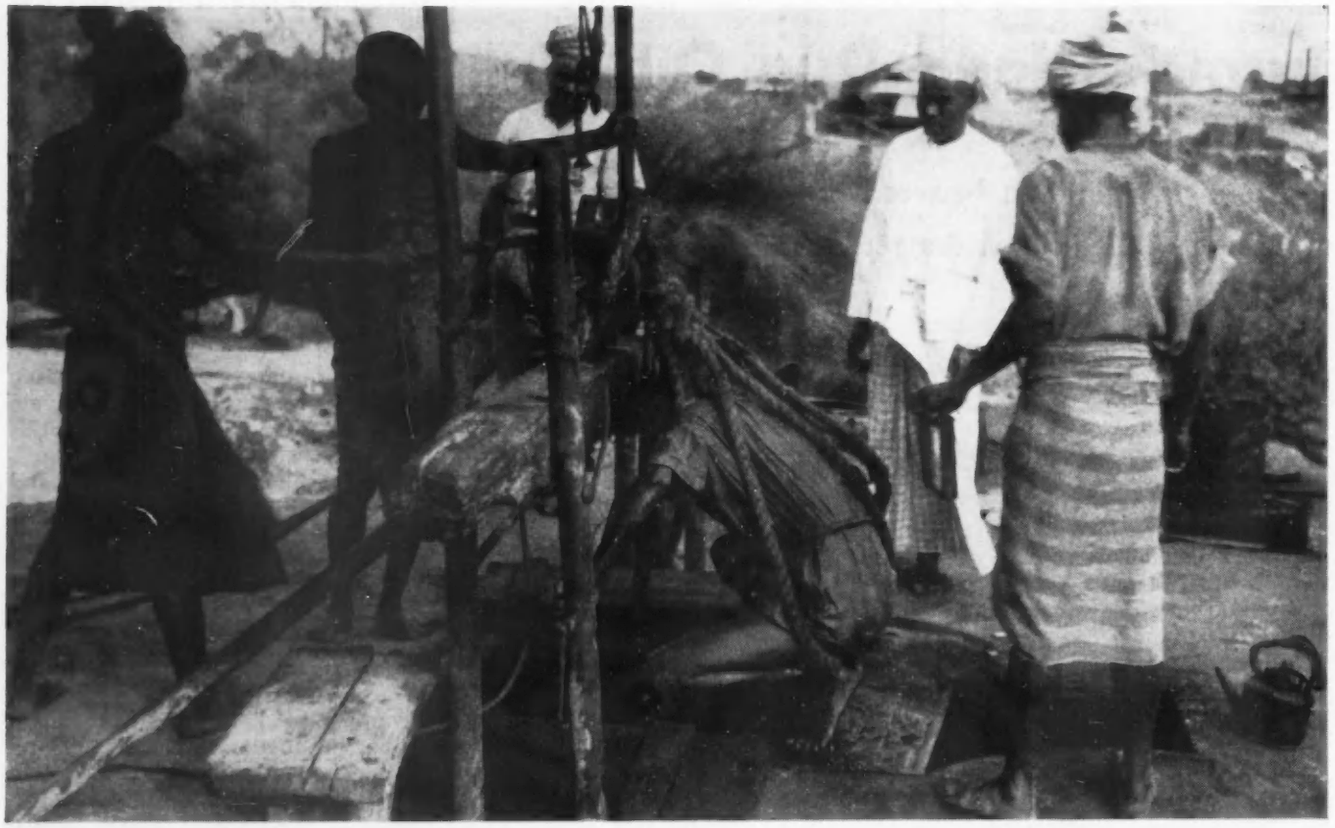
Hand-dug well operations are most primitive. Methods have changed little throughout the ages.

Cases are on record, however, where advantage has been taken of the more prolific production of newcomers, and "leaks" in well head tanks have been diverted to arrest natural decline of a hand-dug well for as many as two years before detection.

Well head gear is simple. It con-

2 This lightweight metal helmet, together with the attached loose-fitting shirt is being connected to hose of manually-operated compressor.

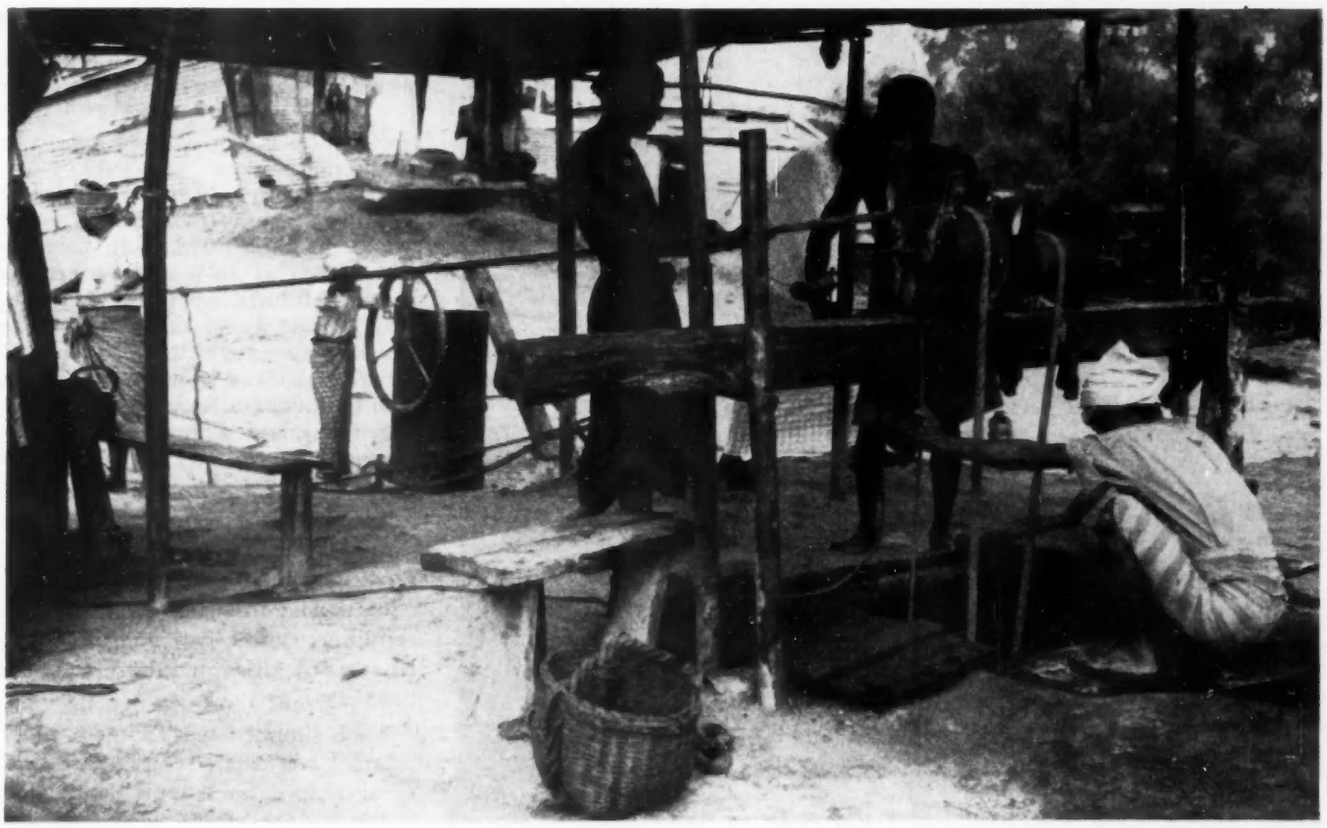
3 Against a modern background, the "driller" has face panel slipped into position while his family watches. The face-piece carries the glass panel which is washed down with a kettle of water as the worker disappears below the surface.



4 The Twin-Sa or "well eater," as the driller is called, gets ready to descend into the well. At right is the kettle filled with water which is used for washing down the headgear.

5 Down he goes. Note that the sand line doesn't pass over a pulley when used for hand signals as worker goes into hole. Only when cleaning out is required does this line change place with air hose. When not in use, wells are closed by hinged lid in foreground.

6 Where the beam will be subjected to the greatest strain, it is further weakened by the method used to fit the simple crutch stick bearings. The beam support (right) shows a use for salvaged oil field materials and illustrates apparent disregard for worker's safety.



7 The Twin-Sa is enroute to bottom as attendants man ropes and compressors and another crouches over well with hand on signal rope to receive any message the Twin-Sa may send. Main rope is strung in and out of hole to enable surface workers to determine Twin-Sa's depth.

8 This type of pump constructed from bamboo has been used for ages by Burmese to raise fluids from shallow wells and ruby mines. Often the pump is used with split bamboo pipe lines to transport fluids.

9 This heavy iron weight is the Burmese rock bit. When hard formations are encountered, the weight is used to break the rock. Method involves countless journeys up and down well to clear out chipped rock.

10 These hand-dug wells require frequent cleaning out—a laborious procedure requiring the Twin-Sa, his crew and all their equipment. Well may be off production for as long as ten days for cleaning out. This production time loss causes a forced layoff for normal bailing production crew.

sists of a heavy beam on which is mounted a number of crudely made wooden pulleys fitted with pieces of sucker rods as axles and running in bearings formed by forks of a tree branch. The digger sits in a noose by which he is raised and lowered, a service performed by a team of women who pull along a towpath a rope corresponding in length to the depth of the well.

The air line, attached at intervals to a supporting rope, passes over a separate pulley and is fed into the well as the "driller" or "Twin-Sa" descends. The rope usually is in poor condition, spliced here and there with lengths of discarded garden water hose.

Tools supplied the Twin-Sa, which means "well eater," consist largely of spear shaped hand tools designed to break up the strata, which is then scraped into bamboo baskets to be hauled to the surface. Fluid contents

11 The Burmese take readily to more modern drilling methods, but the initial cost of equipment is rarely viewed with favor by site owners or land owners. The all-Burmese crew shows some ability on a cable tool well, but, as illustrated here, the driller peers down well by aid of a mirror to reflect the sun's rays—evidence that their methods are not entirely orthodox.

stream back down onto the Twin-Sa.

Rock formations are broken by dropping a heavy iron weight from the surface, a method which requires the Twin-Sa to make endless round trips to retrieve the weight and to remove any broken fragments of formation.

Well shafts are about 3 feet, 6 inches square, the walls being lined with timber to reduce caving. Seepages from higher sands drain into the well. In recent years, the well digger has been protected from petroleum gases by an ill fitting gas mask to which air is pumped by a manually-operated compressor. The mask permits a worker to remain at the bottom for a much longer period than the four minutes which an unprotected digger can be expected to remain conscious.

Lighting a la Burmese is no problem. A small mirror is simply placed at the surface in such a manner that it reflects sun rays to the bottom of the well.

Wages of the hand-dug well worker are low by any standard. The industry is not controlled by any agency which might impose safer working conditions or higher wages. The gas mask has improved the digger's working conditions. The resulting longer "oil face" working periods has erased the need for bandaging his eyes before his descent to insure against the loss of valuable time while his eyes become accustomed to subsurface light. In more prosperous days, a Twin-Sa's wages could possibly be doubled by donations from visitors who paid to have him hauled to the surface for inspection.

Final steps in completing a well carry the digger through the main pay sand which may be as low as 350 feet. In recent years the main pay horizon has been so depleted that it does not present the difficulties encountered in earlier years. It does, however, necessitate a considerable amount of work in a heavy gas-laden atmosphere for a lengthy period before the well can be cleaned up and finished off with a sump below the sand into which oil may collect for production.

Production methods are in keeping with operations on a hand-dug well. Crude is manually bailed from the well. A pair of four gallon lightweight kerosine tins, are used. When the water settles off, the crude is poured into four-gallon tins which are carried by bullock cart to an oil company or local refinery for sale.

A settled yield of two barrels of crude daily is considered a very good well, but the considerable water content requires some hours of labor by a team of women to raise even this quantity.

Many producing wells yield less than a half barrel a day with a water/oil content of ten to one which, even with the high grade crude found in Burma, cannot be considered satisfactory. But the business is dying.

Maintenance and repairs to hand-dug wells present difficulties and expense. Decay of timber linings and constant silting up, together with rising costs, depleted sands and lack of skilled labor, are combining to kill this ancient industry slowly. —**The End**

Oil in Greece?

While no great reservoirs are expected, prospecting companies are beginning to stir around in the hopes of finding commercial quantities.

By JOHN U. TANNHAUSER, Chief of the Petroleum Branch, Foreign Operations Administration, Washington, D. C.

GREECE IS ONE of the few European countries which has not yet embarked on an energetic oil prospecting program, although oil seepages have been recorded there for more than 2000 years.

Of the countries surrounding Greece, Albania currently produces oil at the rate of 7651 barrels daily and Yugoslavia at the rate of 4732 barrels daily. Although Italy is concentrating on the exploitation of its hydrocarbon reserves in the Po Valley, prospects of finding oil in the plains and foothills along the Adriatic coast are good. Only recently Petrosud, a company jointly owned by Gulf Oil Corporation and Montecatini, acquired a concession in the Adriatic coastal province of Marche. Eight other companies, including an affiliate of Azienda Generale Italiana Petroli, are reported active in the same general area.

It is believed that the potential oil bearing areas of the Adriatic Basin, which occupies Western Albania and Eastern Italy, extend into coastal parts of Greece (see A, B, C on map). Favorable areas are also located in the northeast of Greece, in the province of Western Thrace (see D on map).

Mountains which cover the major portion of the Greek peninsula have a general northwest-to-southeast trend and continue in a wide arc under the Mediterranean Sea toward the island of Crete, Carpathos and Rhodes. Mountainous character of the terrain makes the existence of major oil-bearing basins in Greece unlikely. But minor basins exist in various parts of the peninsula which have fair oil prospects.

One group of basins is located in

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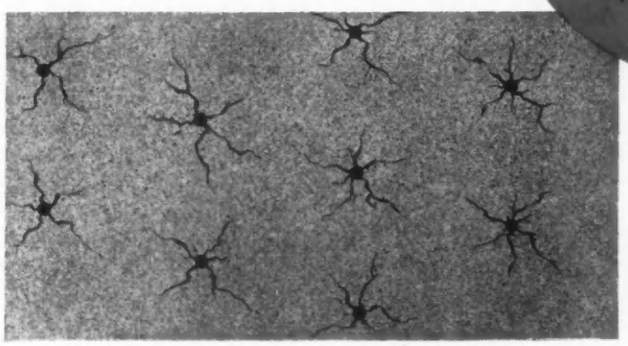

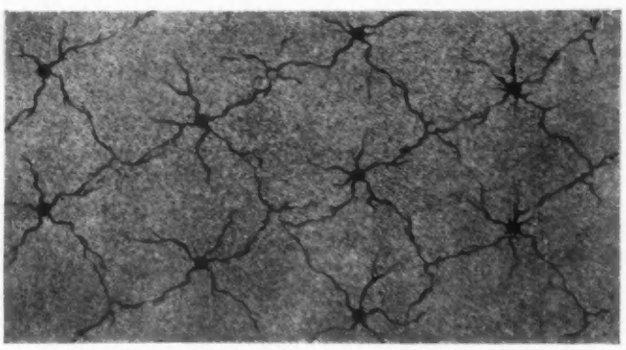

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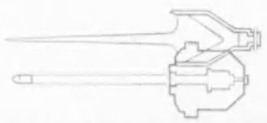

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the west along the Greek Ionian coast in the general area extending across the province of Epirus (C) in the north, the island of Zante (A), and the western plains of the Peloponnesian peninsula in the south (B). The other group of basins, and probably the more promising, is found in the northeast of Greece in Western Thrace (D).

On Zante, where oil seepages have been reported since 484 B.C. in the marshy area at the island's southern tip and in the sea about one-half mile east of those observed on the island, various operators have held concessions since 1865 (see A on map). In 1943, eight shallow wells were drilled there to a depth up to 300 feet, yielding an initial production of about 250 barrels a day. This production rate, however, could not be maintained and the operations were abandoned.

U. S. Geological Survey geologists who visited the island in 1949 are of the opinion that only the northeastern part of the island, where slightly faulted, upper Tertiary formations of considerable thickness dip gently into the sea, warrants further exploration. Zante island, which is subjected to frequent seismic disturbances suffered heavily during the eathtquake last August.

Peloponnesian peninsula is occupied by Cretaceous and Eocene limestone mountains in which older sedimentary formations and metamorphic and crystalline rocks are exposed. Between these mountains and in costal areas are small basins of gently folded upper Tertiary marl, clay and sand. Although pre-Tertiary formations are probably too highly folded and fractured to yield important accumulations of oil, small pools may be found in younger strata in the smaller basins.

The most promising is known as the Pyrgos-Olympia plain located in the western part of the peninsula (see B in map). It is covered by nearly flat lying Quaternary sands and gravel and slightly folded Pliocene strata. Geology of this basin probably resembles that of Zante Island where the Pliocene is underlain by Miocene and older Tertiary formations. For this reason, Zante and the Peloponnesian plain are believed to be parts of a single young Tertiary basin whose center is covered by the Ionian Sea.

Several surface indications exist in the Pyrgos-Olympia Plain. Oil seepages are reported near the towns of Lintsi and Marathos, and a fairly large asphaltic deposit near Marathos was worked commercially many years ago. In recent years, an American-Greek oil company drilled six dry holes in this general area to a depth up to 6000 feet. The same company is currently conducting further exploration. Whether oil is found there in commercial quantities probably depends on the presence of Miocene strata underneath the cover of recent deposits.

Although oil seepages occur in the province of Epirus (see C on map) and its geology resembles that of Albania, the chances of finding oil there in commercial quantities are not promising because the greater portion of the province is occupied by sharply folded and highly indurated Mesozoic and Lower Tertiary limestone formations. Nevertheless, narrow synclinal belts and down-faulted blocks of Upper Tertiary formations are believed to exist.

Operations in Epirus by a British-Greek corporation were interrupted by the war and the subsequent guerrilla activities. In 1950, Greek geologists visited the Tyriapogeni Valley, but their investigations have not as yet been followed by development work.

Western Thrace probably offers the most promising prospects for commercial oil discoveries in Greece. This province is occupied by the Rhodope crystalline massif and three Tertiary basins (see D on map): the Xanthi-Komothini basin (3) in the west, and the Didimotikon (1) and Alexandroupolis-Soufli (2) basins in the east, which are believed to connect with the Erkene basin of Turkish Thrace. The western basin shows only few exposures whereas such are common to the two easterly basins.

Didimotikon basin has a monocline dip toward the northeast, interrupted by two faults running parallel to the regional strike. The northeastern part of the basin is covered by Upper Miocene and younger deposits which conceal the structural features of the underlying older formations. On the other hand, in the Alexandroupolis-Soufli basin folding and faulting is fairly pronounced and anticlinal and graben structures are present. Little is known about the underlying strata in the western basin.

Surface indications of oil are found in Western Thrace. The most important occurs near the town of Melia in the Alexandroupolis-Soufli basin. Half a mile south of Melia, oil appears in exposures of the Eocene basal conglomerate near its contact with the overlying Nummilitic limestone, and an oily odor is noticeable over a wide area during hot weather. Other seepages occur east and northeast of the town, and four miles north of Melia the same limestone is impregnated with asphaltic deposits at its contact with volcanic rocks. Many years ago, an English firm worked this deposit on a commercial basis.

Before the war, the German drilling company, ITAG, prospected in the Alexandroupolis-Soufli basin. The company drilled three 3000-4000-foot tests near the town of Tavri, but was unable to find oil before the war terminated operations. After the war, the area as subjected to guerrilla activities.

In 1950, a party of Greek geologists attached to the Ministry of Coordination inspected the basins, but their survey has yielded no development. Favorable structures of marine

About the Author

JOHN U. TANNHAUSER's interest in the petroleum possibilities of Greece stems from his responsibility for world-wide petroleum development projects of the Foreign Operations Administration. Tannhauser has been on the staff of F. O. A. and its predecessor agency, Mutual Security Agency, since 1948. A specialist on oil production and equipment, he represented his agency on the Foreign Petroleum Committee of Petroleum Administration for Defense during the Korean War. A native of Stuttgart, Germany, Tannhauser is a graduate of George Washington University. Prior to joining the Marshall Plan agency, he was in the Coordination and Economics Department of Standard Oil Company (N. J.) in New York. During World War II, Tannhauser served in the U. S. Army Intelligence Service.

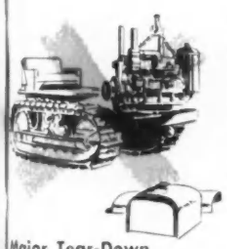
Advance design features make Allis-Chalmers Tractors performance leaders

It takes truly modern equipment to keep pace with today's stepped-up demands — and do it at an operating cost which insures fair and consistent profits. The line of Allis-Chalmers crawler tractors has been designed and built completely new since the war, with the kind of advanced engineering that delivers big-capacity performance at a minimum of maintenance expense.

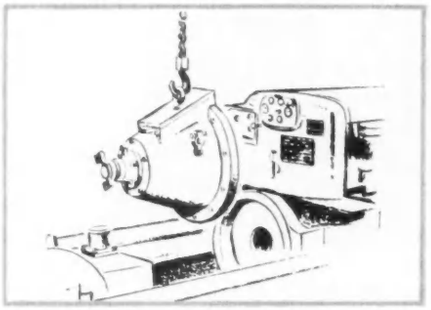
This forward progress is a continuing program. Additional improvements are constantly being incorporated into the HD-5, HD-9, HD-15 and HD-20 tractors. If you are in the market or just interested, see your Allis-Chalmers dealer for all the inside facts that have proved so popular with owners as well as operators and mechanics.

Daily Lubrication

1000-hour Lubrication. Operate six months on a 40-hour week basis with just one lubrication of truck wheels, front idlers and support rollers. Positive seals protect from dust, loose sand, soft ground, mud or water. You gain working time, save labor and lubricant costs, eliminate costly damage from greasing neglect.

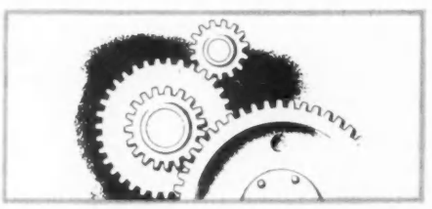


Major Tear-Down



Unit Servicing. No need to remove transmission or engine, radiator, grille, etc., when servicing or removing an Allis-Chalmers master clutch. The unit assembly principle also applies to final drive gear, transmission, steering clutches, engine and truck frame. Save hours of costly service and down time.

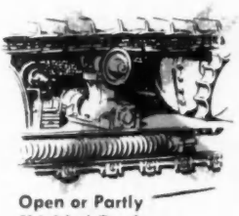
Single Reduction Final Drive



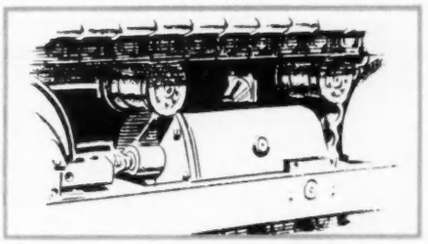
Double Reduction Final Drive. With smaller gears and shorter shafts, double reduction final drives provide better bearing and gear alignment. The "live" axle permits smaller, more serviceable seals. Equally important, double reduction drive provides for smooth, clean bottom construction and the extra ground clearance so necessary on rough terrain.

Ordinary Steering Clutches

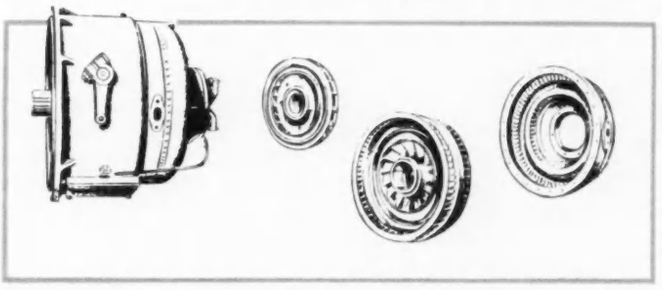
Hydraulic Steering and Self-Energizing Brakes. The HD-15 and HD-20 have hydraulic booster steering; operator exerts only 3 to 5 lb. pressure on controls, so he gets small tractor maneuverability from these 27,850 and 41,000 crawlers. Self-energizing brakes need less pedal pressure, take hold with a firm, uniform grip.



Open or Partly Shielded Track Release Mechanism



Oil Enclosed Track Release Mechanism. Operating in oil and *sealed* against dirt and moisture, Allis-Chalmers track release mechanism seals out mud, ice and debris. Because it's completely sealed, release mechanism is in working condition at all times — providing positive protection when obstacles jam into the tracks.



Hydraulic Torque Converter Drive. The HD-20 is the only crawler tractor where torque converter is standard equipment and part of the basic design. Torque converter gives greater pay load capacity because this unit automatically balances travel speed to the load. And with most shifting eliminated, there's far less operator fatigue.

ALLIS-CHALMERS
TRACTOR DIVISION — MILWAUKEE 1, U. S. A.

ORIGINATOR OF THE TORQUE CONVERTER TRACTOR

Tertiary formations of considerable thickness are likely to be present in all three basins. The most promising areas are those sectors where the Upper Eocene Nummilitic limestone may have developed a reef facies underneath the cover of surface deposits. Such are likely to be encountered in the southern portion of the Alexandroupolis-Soufli basin.

Further investigation of the Miocene formations underlying younger strata in the deeper parts of the three basins is also warranted since Miocene formations yield numerous seepages near Ganos, northeast of Gallipoli in Turkish Thrace.

Prospects Fair. In summary, therefore, prospects of finding commercial pools of oil in the Greek peninsula are fair. At present, Greece spends 18 percent of the value of its total imports, or about $45 million per year in foreign currencies, for the purchase of petroleum products. Of this total, $4 million must be paid in dollars.

The foreign exchange costs of this oil could possibly be reduced by as much as $10 million in all currencies if Greece could shift from the import of refined petroleum products to imports of crude. The long standing desire of the Greek government to build a refinery is, therefore, quite understandable.

The cost of petroleum imports could, however, be even further reduced through local crude production. It is estimated that at current prices, each 1000 barrels of daily domestic production of crude would reduce Greece's foreign currency bill by almost $1 million a year if calculated at current Middle East crude prices delivered at Athens.

During recent years, probably the most important deterrent against an active oil exploration program, in Greece has been the country's economic and political instability. This situation has improved markedly, however, during the past six months, and experts predict a continued improvement in the country's economic condition. Encouragement of oil prospecting in Greece could act as a further impetus to this trend, particularly if the government offered favorable conditions to attract active, qualified private prospectors through appropriate legislation. —**The End**

ACKNOWLEDGMENT

The author wishes to thank Frank Reeves, former geologist with Petroleum Administration for Defense, for checking geological data in this article.

a WORLD of OIL

By **DON KLIEWER,** WORLD OIL Staff

Mexico: Drilling on Chapala 1, the westernmost exploratory test begun recently in Jalisco, on the shores of Lake Chapala, near Tizapan, in a tract between Jalisco and Michoacan States, is down to 2800 feet and on hard rock, but hopes are held high by Pemex . . . Drilling is expected to begin shortly in the Yucatan peninsula in the southeast, until now unexplored for oil, and Pemex has asked permission of the federal government to drill in an area of about 25,000 acres, known as the Sacapuc property. Not yet available is the specific location of the area within Yucatan, most isolated and thinly populated state in the nation.

Argentina: The country is in the market for Mexican oil, Ambassador Julio Tezamos Pinto said recently while in Mexico City, and negotiations with Pemex are now under way . . . What is sought is a barter deal along the lines of the one made in 1951, when Argentine wool was traded for 85,000 barrels of Mexican oil . . . The Argentinians hope to boost purchases of oil and oil derivatives considerably.

Lebanon: A deep well drilled by Western Pacific Oil Company on the concession of Soc. Libanese des Petroles in the Bakaa plain, has been abandoned as a dry hole at 8700 feet.

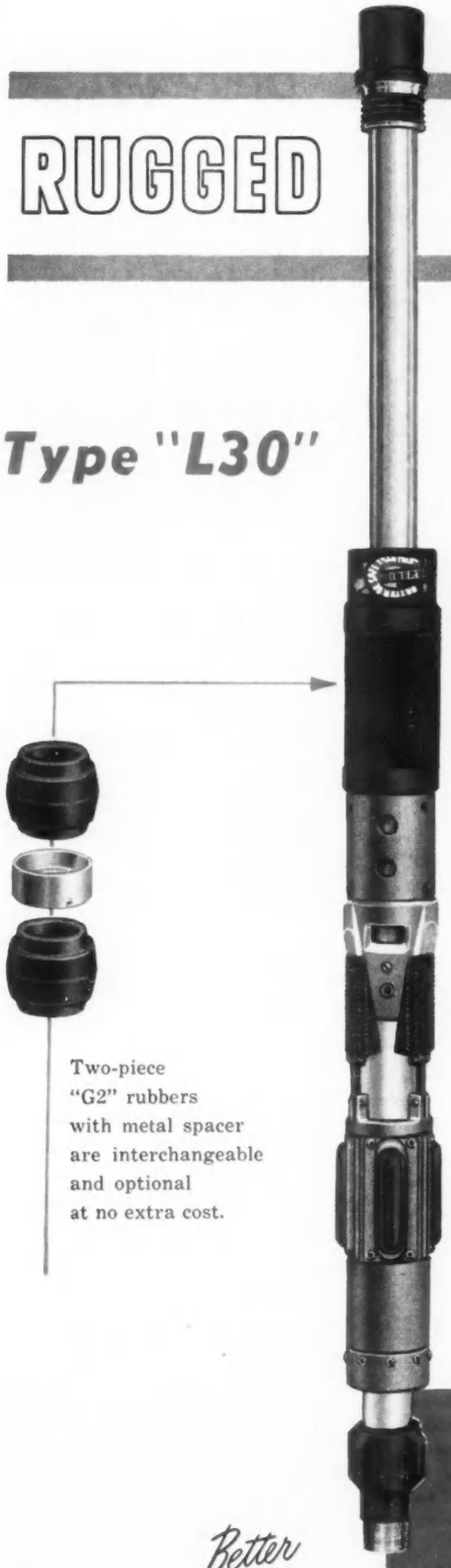
Germany: Stockstadt 7, drilled in the new Stockstadt oil field belonging to Gewerkschaft Elwerath, has encountered gas in Miocene beds at 2230 feet . . . Wintershall A.G.'s Rehden 9, about five miles east of Diepholz town, has discovered natural gas, with production tests yielding 5.2 Mmcf. daily through a 9/32-inch choke from the dolomite of the Zechstein at a depth of 6140-6160 feet . . . Despite the fact that Rehden 6, about three miles west of Rehden 9, failed to find natural gas in economic quantities, the field may be expected to increase its extent by several square acres . . . A new field may be on the eve of discovery in the Upper Rhine valley of Badonia—several hundred gallons of viscous crude have been bailed from the individual sand layers of the cyrena marl at 1394-1624 feet in Deutsche Erdoel A.G.'s Untergrombach 1. DEA will test deeper horizons before deciding upon further development . . . A 5-inch pipe line has been constructed from Stockstadt to Gernsheim on the Rhine river, where loading stations are being completed . . . Preussag's wildcat Vorhop 6, drilled two miles southeast of the rail station of Wahrenholz on the west flank of the Vorhop salt structure by Gewerkschaft Elwerath-Preussag, has discovered oil at about 4590 feet, with production tests yielding 1500 barrels of crude through a 3/16-inch choke.

Canada: Premier Manning, head of Alberta's conservation-minded government, believes that natural gas production in his province will equal the importance of oil in the country's economy within the next few years . . . Monthly statistical supply-demand forecasts of the oil industry are being made available by the Canadian federal government as a result of a recommendation of the Oil and Gas Committee of the Mines Ministers Conference.

Great Britain: D'Arcy Exploration Company's test well at Plungar, near Nottingham, England, which recently produced oil at 2820 feet, has been completed at 3098 feet. A seismic survey is being made in the area, and a second well will be located when survey results and production test of Plungar 1 are completed . . . A $2.8 million program of natural gas exploration in Great Britain is underway by D'Arcy Exploration Company on behalf of the Gas Council. Seismic exploration in southeast Yorkshire and Lincolnshire will extend over the next 18 months . . . Drilling will begin late this month at Cousland, near Edinburgh, to evaluate the region's gas reservoir, which were found in 1938. After the Cousland well is completed, drilling sites will be selected in the counties of the south coast from Kent

RUGGED AND RELIABLE

GUIBERSON'S
Type "L30" *Deep Well Packer*



Two-piece "G2" rubbers with metal spacer are interchangeable and optional at no extra cost.

For deep well work with high temperatures and pressures, use Guiberson's dependable "L30" Packer. It will give you long valve travel (30 inches) with minimum overall length at no extra cost. You can pull the "L30" surely and safely. The fast-action automatic latch, protected by a positive anti-lock device that assures ready release, snaps easily into latched position. Tough, long-wearing friction pads supply ample drag. Packing rubbers of advanced design will not vulcanize to the casing wall. All these features and others too are available on the "L30" in a wide range of casing sizes.

For circulating *above* the packer, Type "L30P" with perforated mandrel is available. Packers with longer or shorter valve travel may also be had on special order.

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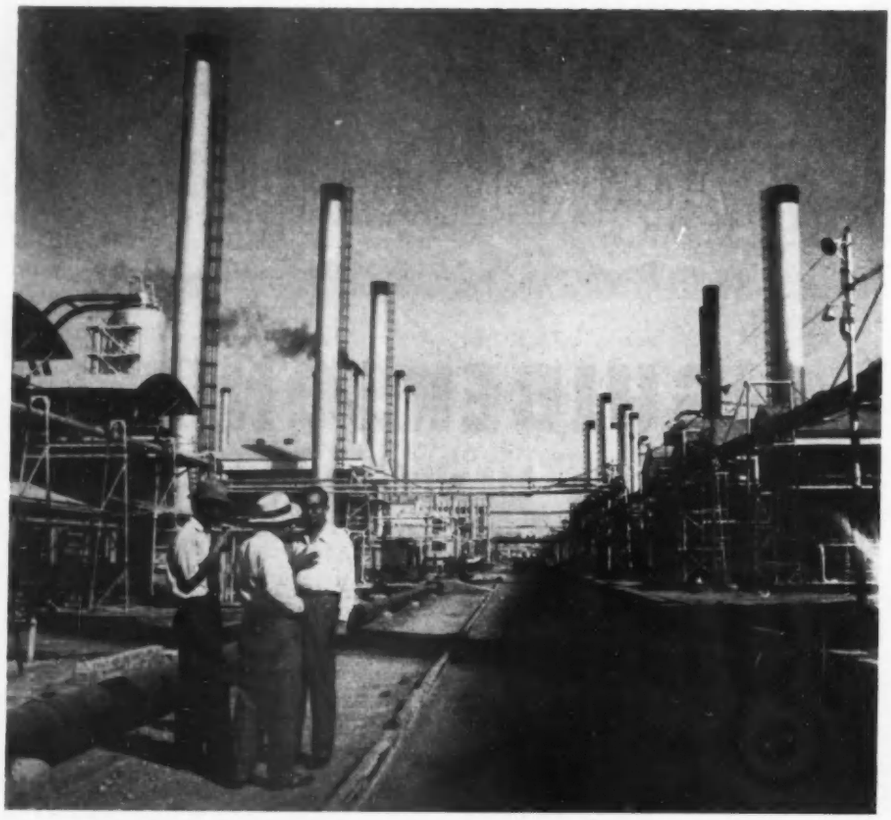

AT THE ABADAN REFINERY, the world's largest, a thin trail of smoke curls out of a single stack. Three years ago, before the Iranian government took over the refinery from the Anglo-Iranian Oil Company and nationalized it, Abadan hummed with activity. Today, Iran is running the equipment at about 5 percent of capacity—just enough to fill domestic needs.

to Dorset, with later exploration scheduled in Cheshire, Warwickshire and Worcestershire.

Egypt: Southern California Petroleum Corporation has 17 American technicians at work, including 10 American drillers and 5 American engineers and geologists . . . SCPC's present program includes drilling of one or more wells on each of seven seismograph structures in Sinai Peninsula, using at least three strings of rotary drilling tools. The structures lie within the boundary of 17 lots (about 400,000 acres) now held under lease by International Egyptian Oil Company, Inc., in which SCPC will own 10 percent and have an option on an additional 5 percent . . . Feiran 1 well is flowing about 130 barrels a day of 23 gravity crude. Feiran 2 is drilling below 3500 feet, having set 515 feet of 13⅜-inch surface casing. Sidri 1 well on the Sidri structure has been spudded in eight miles northeast of Feiran 1.

The Netherlands: The Netherlands Drilling Company, formed by Drilling and Exploration Company, Inc., of Houston, Texas, and Dutch interests, has begun operations and is currently operating one rig on a contract basis. The new company will operate in Europe and the Near East.

Burma: The government is continuing to consider acquisition of a controlling interest in the nation's British-owned oil industry whose assets are placed by common consent at more than $40 million.

Venezuela: Phillips Oil Company has stacked three of its four active rigs, two in Guarico and one in Anzoategui.

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The complete editorial index covering all issues of WORLD OIL published during 1953 has been prepared and is bound separately in convenient pamphlet form. It will be sent free to all subscribers who write requesting copies.

Orders should be addressed immediately to the Librarian, Gulf Publishing Company, Box 2608, Houston 1, Texas, as quantities are limited.

What's

O. I. TORKELSEN, formerly exploration and production coordinator for The British American Oil Company, has been appointed to the newly-created post of vice president in charge of exploration and production for Western Canada. In addition, Torkelsen will be responsible for crude purchasing and crude transportation in Canada. His headquarters will be in Calgary.

A native of Minnesota and a graduate of the University of California, Torkelsen joined British American 14 years ago as a field geologist, becoming a vice president of the British-American Oil Producing Company. He went to Toronto in March, 1951, to be the company's exploration and production coordinator. He retains his post as director of the British-American Oil Producing Company and of the Toronto Pipe Line Company.

•

BRAME WOMACK, who has been staff geologist in the Production Department headquarters of Sohio Petroleum Company in Oklahoma City, has been made manager of Sohio's Canadian operations. His headquarters will be in Regina, Saskatchewan.

Womack has been employed by Sohio for ten years. He started with the company in 1943 as district geologist in the Shreveport, Louisiana, office. In 1949, he was made division geologist of the Western Division, in Oklahoma City, and March 1, 1953, he was promoted to staff geologist.

Womack was born in Texarkana, Texas. He was educated at elementary and high schools in Dallas, Texas, and was graduated from the University of Oklahoma in 1932 with a major in geology.

Happening

AMONG WORLD OIL MEN

MORE THAN 200 NOMADS and guests attended the annual Nomad luncheon meeting in the Blackstone Hotel in Chicago during the November annual API meeting. H. W. Haight, executive vice president of Creole Petroleum Company and director of Standard Development Company, Caracas, Venezuela, was guest speaker. Seated at the speakers' table are, left to right: G. H. Eichler, Englewood, New Jersey, Petroleum Equipment; Lawrence Cade, Caracas, Creole Petroleum Company; Howard B. Book, New York, Reed Roller Bit Co.; Courtney J. Berlin, Dallas, Baker Oil Tools, Inc.; J. D. Hughes, Los Angeles, Lane-Wells Co.; Haight; Opie Dimmick, Tulsa, Oklahoma, Century Geophysical Corp.; Dr. Gustavo Thery, Caracas, minister of Mines and Petroleum, Venezuelan Government; John R. Suman, New York, vice president and director, Standard Oil Company of New Jersey; Herschel J. Wood, Houston, Texas, Lebanon Steel Foundry; Robert K. Franklin, Houston, Rolo Manufacturing Co.; J. G. Pew, Philadelphia, Sun Oil Company; Ed. M. Fontaine, Houston, National Tank Co.; M. J. Rathbone, New York, Standard Oil Company of New Jersey; and M. A. Wright, Tulsa, Oklahoma, Carter Oil Co.

HERBERT I. HARRIS has resigned as geologist for The Texas Company, Salt Lake City, Utah, to join Pan-Israel Oil Company, Inc., and Israel Oil Licenses, Inc. He will make his headquarters in Jerusalem.

•

A new board of management has been elected for Deutsche Erdoel A. G. (Dea). It consists of the following members: DR. ALHARD VON BURGSDORFF-GARATH and KARL SCHIRNER (deputy chairman); ROBERT KORTE; DR. WOLFGANG LEINEWEBER, DR. ALFRED PETERSEN, HANS RINN, DR. HERMANN ROMER, ALEXANDER SCHARFF, MAX H. SCHMID, and five representatives of employes.

Three new senior appointments have been made by Basrah Petroleum Company following a reorganization within the company. JUDGE ABDUL HAFIDH EL TAHA, formerly senior liaison officer, has become manager of the newly-created general department; T. W. ELLIOTT, until recently assistant fields engineer at Kirkuk for Iraq Petroleum Company, has been appointed chief engineer; and H. M. THOMSON, previously assistant fields manager for IPC at Kirkuk, has been named personnel manager.

A graduate of the Law School, Baghdad, Judge Taha joined Basrah Petroleum in July, 1949, after a distinguished career in public service as a judge in Iraqi courts and as a public prosecutor. After serving two years as administrative assistant to the manager on lands and local government matters, he became senior liaison officer in 1951.

Elliott joined Iraq Petroleum in 1946 after war service and was sent to Kirkuk as senior civil engineer until being appointed assistant chief engineer in June, 1952. Thomson joined Iraq Petroleum shortly before the war in 1939 and rejoined the company in 1946. He went overseas in 1948, working first in Tripoli and later in Kirkuk, where he became assistant fields manager in 1951.

Iranian Representative Seeking Barter Business

Ahy Diahangire, vice mayor of Teheran and member of Iran's Superior Council of Industry and Economy, recently visited Rome for the second time to negotiate barter trade between Iran and Italy. The representative of the Iranian government said the contractual obligations could total $100 million and would involve exchange of Italian manufactured goods for Iranian crude and refined products.

On his initial visit, Diahangire ordered 300 tank cars from Ansaldo Company in Genoa, several hundred tractors and motor vehicles from the Fiat Company at Turin, and six motor boats from shipbuilders.

This action has led some Italian business quarters to believe their government has already guaranteed the issuance of import licenses covering the crude and petroleum products and export licenses for the goods which Iran has bought on the Italian market. Included on the Iranian purchase list were $11 million worth of steel rails, $5 million worth of tires, and $20 million more motor vehicles. Diahangire said Italy will buy petroleum and products for 5-10 percent below world postings.

Italy has not reached a decision on the Iranian proposals, and the Iranian delegate is to visit Venice, Milan, Turin, and Genoa before returning to Rome to learn what decision will be made.

From Italy, Diahangire will travel to Yugoslavia, Bulgaria, Hungary, Czechoslovakia, and Poland in an effort to negotiate sales of crude oil and petroleum products for sugar, textiles, telephone apparatus, and electrical machinery.

THE ROYAL'S

"Oil-Bankers" keep up-to-date on the Canadian oil and gas picture

J. C. Mayne, Alberta Supervisor (left) doesn't encourage chair-sitting in the bank's Oil and Gas Department, whose officers make frequent trips into the field.

The officers who staff our Oil and Gas Department are men of varied experience and long training. In their capacity as "oil-bankers," they facilitate and coordinate the many special services called for by oil and gas men. Their knowledge can be of great value to prospective entrants to the field.

Our Oil and Gas Department provides a unique *Special Bulletin Service*, containing up-to-the-minute information on all important aspects of the industry. For a free booklet containing bulletin titles, and other useful information, write: Oil and Gas Department, 102 Eighth Avenue, Calgary, Alberta.

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Canada's Oil Bank

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Over 780 Branches in Canada and Abroad

Total assets exceed $2,675,000,000

Chinese Reds Claim Crude Output Is Rising

The Chinese Communist government has announced that 1952's oil production "significantly exceeded" the highest levels attained prior to World War II.

A dispatch from Peking to the official Russian newspaper *Pravda* said petroleum output in 1952 was almost 25 percent higher than in 1951 and that gasoline output was up almost 88 percent.

Petroleum production in 1953 was slated to reach 166 percent of the 1951 level. Attention is now being directed toward exploration and development of new oil fields.

Pemex to Build 2 New Gulf of Mexico Lines

Construction of two new pipe lines on the Gulf of Mexico coast will begin shortly, according to Pemex, government oil monopoly.

The lines will transport oil from the newly-discovered fields of Ordóñez, Santa Agueda, Mazutla, Xacotla, Ocotepec, and Horcón to refineries at Tampico and to the port of Tuxpan, a hundred miles south.

Pemex also reports completion of the pipe line between Salamanca and the City of Morelia, a distance of 66 miles. Still in construction is the line between the terminal of Lagos de Moreno and the City of Aguas Calientes, 52 miles away. It is planned to extend the latter line beyond Aguas Calientes to Zacatecas next year.

New Equipment

SUPPLEMENTING COMPOSITE CATALOG

Four-Wheel-Drive Models

The motor truck division of International Harvester Company has announced introduction of two new four-wheel-drive models specially designed for use in rough terrain. The two models are the International R-140-4x4 with gross vehicle weight rating of 11,000 pounds, in 130 or 142 wheelbase; and the R-160-4x4, with GVW rating of 15,000 pounds, in 154 and 172-inch wheelbase.

Illustrated is the Model R-140-4x4, mounting a Failing drilling unit designed for mineral exploration and seismic shot hole work, has gross vehicle weight rating of 11,000 pounds in 130 or 142-inch wheelbase. The Model R-160 has GVW rating of 16,000 pounds in 154 and 172-inch wheelbase. Front and rear axles of the new models are single reduction hypoid bevel gear type. Transfer case in both models has 1 to 1 and 1 to 1.87 gear ratios providing, in combination with the four-speed transmissions, 8 forward and 2 reverse speeds. Both models are available with front-mounted winch.

This item supplements International Harvester Company data on pages 2633-2636 of the Composite Catalog, 19th Edition.

Circle No. 1 on Postcard

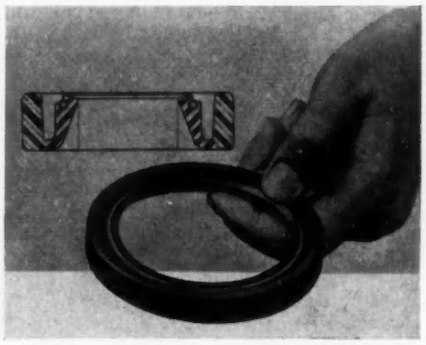
Drilling Jar

Acme Fishing Tool Company has developed the new Acme alloy heat treated jar, companion tool to the famous Acme alloy drilmor bit. During experimental work necessary to the development of this tool, the selection of the proper alloy steel proved a problem. A combination of high strength, wear resistance and toughness was achieved after extensive field tests. This heat treated jar is expected to give two to four times the service received from regular carbon steel jars. The manufacturers state that some users report drilling as many as three complete wells in the Zanesville, Ohio, field to a depth of 3800 feet each.

During Acme's experience in production of link type jars, facts concerning the manufacture and use of this type tool were studied and incorporated into the development of the improved drilling jar.

This item supplements Acme Fishing Tool Company data on pages 153-160 of the Composite Catalog, 19th Edition.

Circle No. 2 on Postcard



Oil Seals

LPD clipper seal is a new design which Johns-Manville has added to its line of all molded oil seals. The initials LPD stand for "line-contact proportionate design." The lip contacts the shaft in a thin line around the shaft circumference and the lip and hinge areas stay proportionately the same throughout the range of flange widths and shaft sizes. The husky lip section provides a deep retainer groove for the garter spring that helps assure sealing effectiveness. The composition heel is designed for a press fit into the cavity. The heel and lip compounds in which the new LPD clipper seal is available enable it to withstand a wide range of service conditions and temperatures.

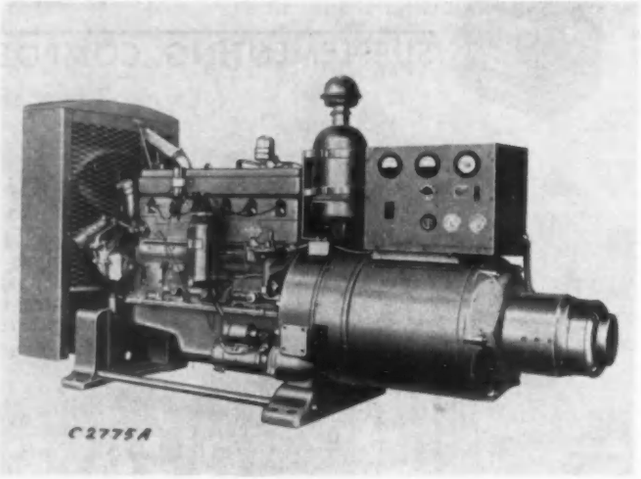
This item supplements Johns-Manville data on pages 2698-2700 of the Composite Catalog, 19th Edition.

Circle No. 3 on Postcard

Save time! Keep informed! Circle numbers on postcard, page 241

Electric Plant

Expanding its line of gasoline engine driven electric generating sets, D. W. Onan & Sons, Inc., announces a new 50KW, 62, 5KVA electric plant, Model 50KA. This new unit is designed for any type of job requiring heavy duty primary or emergency standby power and will deliver a full rated 50,000 watts at 80 percent power factor with ample overload capacity. Powered by an International Harvester gasoline engine, the new generating plant delivers 104 horsepower at 1800 rpm and has a 450 cubic inch piston displacement. It is equipped with replaceable cylinder liners, roto exhaust valves, oil bath air-cleaner and a remote, 12-volt starting system. Water-cooling, full-pressure oil lubrication with a sump capacity of nine quarts and a low oil pressure cut-off to protect the engine are other features offered. The control box, mounted over the generator, is equipped with a charge rate ammeter, electric-water temperature gauge, electric oil pressure gauge, start-stop buttons and running time meter.



This item supplements D. W. Onan & Sons, Inc. data on pages 4032-4033 of the Composite Catalog, 19th Edition.

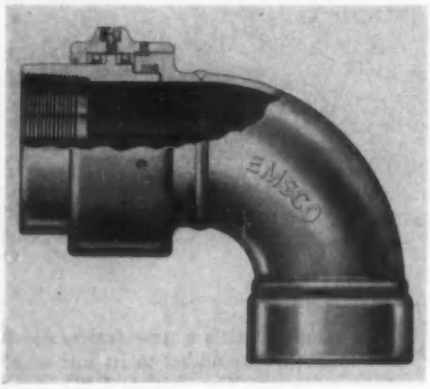
Circle No. 4 on Postcard

Acid Hose

Development of a hose highly resistant to a wider range of acids, salts, alkalies and other solutions has been announced by Raybestos-Manhattan, Inc. This improvement has been made in its condor acid discharge and condor acid suction hose by compounding a new special synthetic with other acid-resisting materials for tube and cover. The improved hose withstands many organic and inorganic acids, salts and alkalies, and can be used to convey other solutions previously not recommended for rubber hose. The tube of this hose is also claimed to be highly abrasive resistant to withstand slurries.

This item supplements Raybestos-Manhattan, Inc., Manhattan Rubber Division, data on pages 3192-3193 of the Composite Catalog, 19th Edition.

Circle No. 7 on Postcard



Low Pressure Joint

A new addition to the Emsco ball bearing swivel fitting line specially designed for applications and pressures to which schedule 40 pipe would be subjected has been announced by Emsco Manufacturing Company. The Type LPR Emsco fitting illustrated is designed for a maximum pressure of 1000 psi at a maximum temperature of 225° F. Other types are available for pressures up to 15,000 psi and temperatures to 750° F. A feature of the Type LPR is its easy turning at low torque, and low resistance to flow and all around safety. The thrust load is taken directly through the center of the balls. The hardened and ground races on which a double row of ball bearings rotate are perpendicular to the lines of force. Packing materials, including Teflon for corrosive and other services, are independent of the ball rows and are unaffected by ball race wear. Emsco offers more than 500 various types, styles and pipe sizes ranging from 1¼ to 4 inches. End connections may be scarfed, bored for welding, threaded or flanged to meet customer specifications.

This item supplements Emsco Manufacturing Company data on pages 1481-1600 and 1374 of the Composite Catalog, 19th Edition.

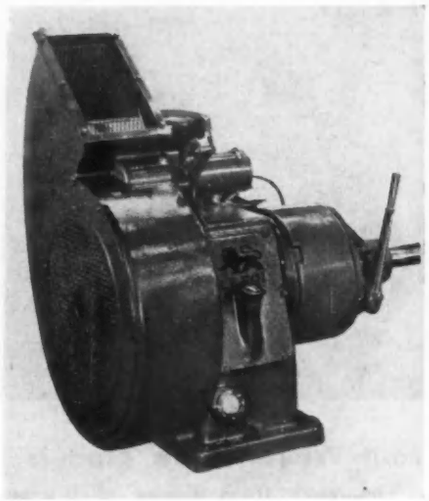
Circle No. 5 on Postcard

Gas Lift

A new and improved gas check valve has been incorporated in the McEvoy gas lift. The new valve is now being installed on all gas lifts manufactured by the company and can be installed on all repaired valves when requested. The principle of operation is that as soon as gas flow begins, the ball is lifted against the rubber pad by the pressure drop through the valve. It remains fixed in this position as long as any appreciable amount of gas is flowing through the valve. The instant that the valve closes, and pressure reverses, the ball drops onto its seat sealing tightly against backflow of the gas or well fluid. The advantages are that the entire check valve assembly is readily removable through the opening under the three-fourths-inch pipe plug; the ball and seat are replaceable and the threaded connection can be broken for inspection when the valve is being repaired. With the pipe plug and check valve assembly removed, an access opening is available for cleaning the gas tube with a rod or wire in the event it has sanded or corroded.

This item supplements McEvoy Company data on pages 3301-3352 of the Composite Catalog, 19th Edition.

Circle No. 6 on Postcard



Pumping Engine

Le Roi Company has added a new single cylinder, valve-in-head, pumping engine to its line of products for the petroleum industry. The new engine, called the A114, is a 114 cubic inch displacement, single cylinder, valve-in-head, pumping engine designed especially for oil field use with an extra heavy flywheel. The A114 will develop 14.8 maximum horsepower and the 9.7 API horsepower at 1200 rpm, while its larger sister unit, the A288, develops 26 maximum horsepower and 17 API horsepower at 720 rpm. Replaceable wet sleeves for quick service, a specially designed governor which responds quickly to unbalanced load conditions, a short heavy counter balanced crankshaft and a heavily constructed crankcase are design features which make both models long lasting engines.

This item supplements LeRoi Company data on pages 3022-3025 of the Composite Catalog, 19th Edition.

Circle No. 8 on Postcard

Save time! Keep informed! Circle numbers on postcard, page 241

PUMPS for PETROLEUM

FLUID POWER PUMPS

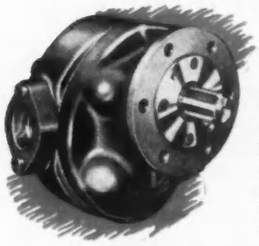
in equipment and vehicles required for modern exploration, drilling, production, piping and refining of petroleum. Here is a most comprehensive range of sizes, types, capacities and pressures from 0 to 1500, 2000 and 3000 psi together with hydraulic motors, valves and cylinders for developing complete hydraulic circuits. Here is power which combines safety, flexibility, limitless variations and sound economy . . . hydraulic power at its best.

LIQUID HANDLING PUMPS

Virtually "any substance that will flow through a pipe," including petroleum products from naphthas to crudes and acid sludge, can be efficiently and economically handled in small or bulk quantities by Pumps available from this single source. There are deep and shallow well Centrifugal and Turbine Types, Rotating Plunger and Herringbone Pumps embracing a very broad range of types, sizes and constructions.

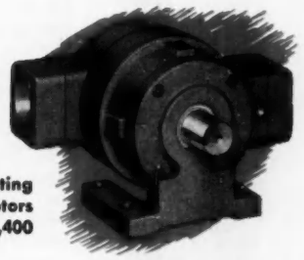
VACUUM PUMPS

High vacuum pumps for laboratory or high production service in research, vacuum distillation, refrigeration, dehydration, chemical processing, de-aerating, etc.



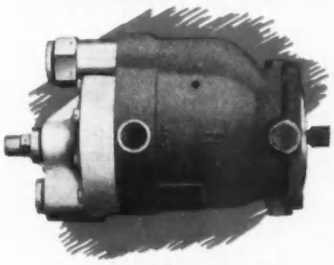
HYDRECO
GEAR TYPE PUMPS

Reversible and non-reversible. Gear type pumps in exclusive FOUR-BOLT design . . . capacities from .5 to 130 gpm and operating pressures to 1500 psi . . . flange or foot mounted . . . furnished with keyed shaft with spline shafts optional. Also dual and tandem models.



DUDCO
DUAL VANE TYPE PUMPS

DUDCO Pumps provide a broad range of sizes with capacities to 120 gpm and pressures to 2000 psi. Also available in dual units operating from a single drive. Hydraulic motors with starting torque outputs to 14,400 lb. in.

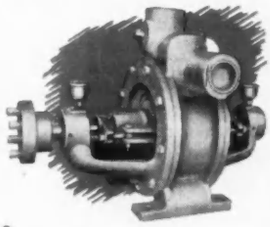


STRATOPOWER
PISTON TYPE PUMPS

Axial reciprocating piston type . . . constant or variable delivery with capacities of .25 to 10 gpm at nominal speeds of 1500 rpm with maximum of 4500 rpm . . . working pressures to 3000 psi . . . direct engine and individual electric motor driven models.

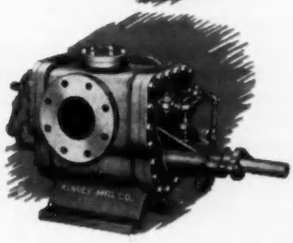
KINNEY
VACUUM PUMPS

Single stage models to produce absolute pressure readings of 10 microns (.01 mm Hg.) . . . compound pumps producing readings of .2 microns (.0002 mm Hg.) or better. These Kinney High Vacuum Pumps are available in sizes for laboratory as well as high production use.



AURORA
CENTRIFUGAL & TURBINE PUMPS

Deep well, sump, drainage and condensation return units, household water systems. Industrial low and high pressure liquid handling pumps. Direct motor and countershaft driven horizontal and vertical models. Capacities 3 to 7500 gpm.



KINNEY
LIQUID HANDLING PUMPS

A complete range of sizes in Rotating Plunger and Herringbone Gear Pumps to handle light or heavy liquids, from gasoline to asphalts. Available in plain or steam jacketed models.

THE NEW YORK AIR BRAKE COMPANY
230 PARK AVENUE • NEW YORK 17, N. Y.

THE NEW YORK AIR BRAKE COMPANY
230 Park Ave., Dept. WO, New York 17, N. Y.

Gentlemen: Kindly send me additional information on: Hydraulic Pumps ☐ 1000 psi ☐ 2000 psi ☐ 3000 psi Liquid Handling Pumps ☐ Vacuum Pumps ☐

Name.....

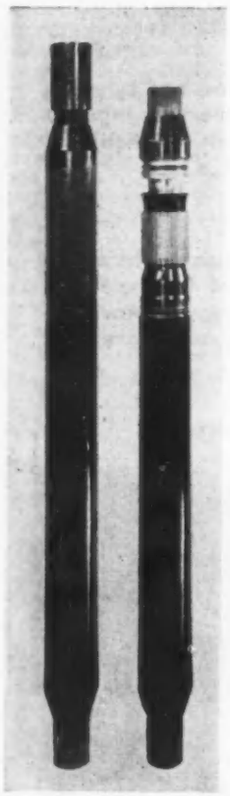
Address.....

City..... **State**.....

Other New Equipment

Gas Lift Valve

Cummings Incorporated has introduced a new gas lift valve which applies a new operating principle to gas lift. The valve is entirely casing pressure operated and has no moving metal parts. Its only moving part is an oil and gas resistant rubber sleeve which bends slightly to permit entry of gas into the tubing. Used in either intermittent or continuous flow, operation is determined by the gas injection rate at the surface.



The valve is run in the tubing in the conventional manner with the highest pressure valve at the top. Prior to installation, the valve pressure chambers are loaded and then sealed by the cap screw at the lower end of each valve. This loading pressure is applied underneath a rubber sleeve and the exit slots of the finned retainer. When the casing pressure exceeds the loaded pressure of the valve, the rubber sleeve is bent inward, allowing gas to flow through the inlet slots and over the sleeve. It then travels through the exit slots, over a rubber reverse check and into the tubing through flow ports.

Only 10 to 15 pounds pressure increase in the casing annulus is necessary to open the valve to maximum flow port capacity. Upon reaching this pressure, the valve remains in open position until the casing pressure drops to the opening point at which time the valve snaps shut. As long as the tubing pressure is below that of the casing, the above described operation will take place regardless of the pressure existing in the tubing at instant opening or closing.

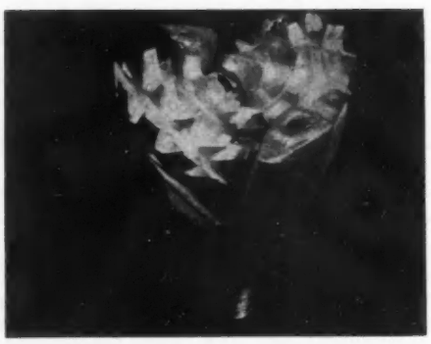
Circle No. 9 on Postcard

D-C Arc Welder

Reductions in size and weight and increases in ease of maintenance and user and operator convenience are advantages of a new Westinghouse selenium rectifier d-c arc welder. This new welder incorporates the characteristic advantages of the selenium rectifier type welder—high efficiency with no-load losses; a-c welding performance with d-c welding characteristics; and high dependability with low maintenance due to an almost complete lack of moving parts. The heart of the new welder consists essentially of two parts; a three phase, full wave selenium rectifier and a transactor unit which is a combination three-phase transformer and movable core reactor. Smaller and lighter, the transactor unit has two three-phase laminated cores.

Although the use of aluminum has been the major contributor to weight reductions, certain design modifications have resulted in decreased weight as well as size reduction, simplified construction, improved weather protection and better ventilation. Maximum cooling is afforded by axial-flow ventilation.

Circle No. 10 on Postcard



Jet Bit

A new combination jet bit which combines features of rock bit cones, jet action and the side cutter drag bit is available from the Gault Tool Company. The jets, which flow through the drag type reamers, place the impact on the formation 1½ inches from the bottom, keeping the jet action from being dissipated before it hits the formation. In addition to the two jets of circulation fluid, a water course carries a stream of fluid to the top of the cones, as in the conventional type bits, to aid in cleaning the cones and to prevent "balling up." The two-toothed cone cutters mounted opposite each other provide the cutting action, while the two parallel drag type reamers keep the hole to full gauge and act as stabilizers to prevent wobbling. Using the various types of circulating fluids, this bit has proved well adapted to shales of all densities and beds of unconsolidated formations.

Circle No. 11 on Postcard

Sand Filter

A new production string filter designed to eliminate production problems caused from sand and foreign material has been announced by Platt and Bashara of Houston. This new tool has a number of applications for the oil industry.

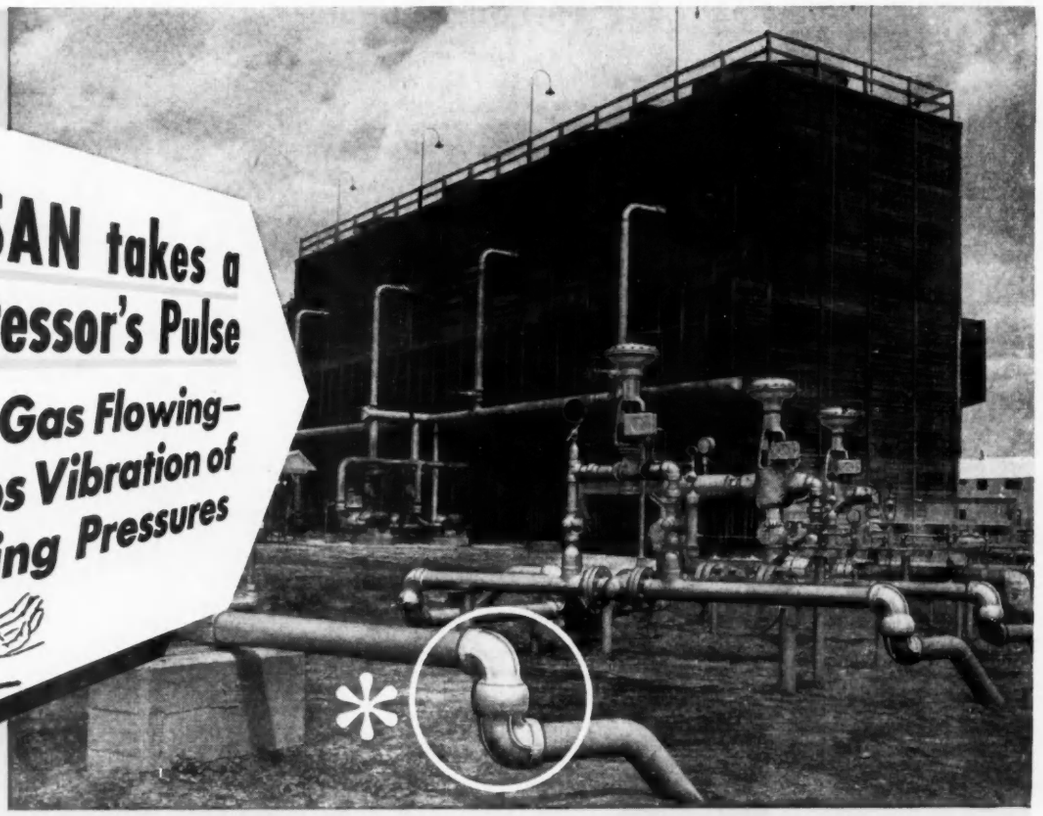
1. The filter takes the place of the perforated nipple on a production string and serves to filter out abrasive material which shortens the life of balls and seats, steel rings and suction cups, inside the pump.
2. It has application for gas metering lines where it serves to filter out all carbon and gum deposits which might be harmful to delicate gauges and meters.

The filter is contained inside a six-foot joint of tubular goods which has been slotted to allow the entrance of well fluids. The slots vary from 14 to 18 thousandths

Save time! Keep informed! Circle numbers on postcard, page 241

CHIKSAN takes a Compressor's Pulse

Keeps Gas Flowing— Absorbs Vibration of Changing Pressures



Not only do the stamina and flexibility of Chiksan Joints take expansion in their stride, they absorb pulsation and vibration.

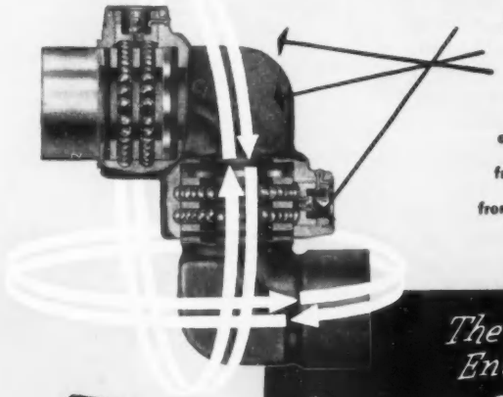
When the Plymouth Oil Company wanted a better way to handle the expansion and contraction of its 2500-3500 lb. natural gas re-pressuring line in its compressor station in Sinton, Texas, back in 1946, it tried Chiksan 2-inch high pressure ball bearing swivel joints. So successful were Chiksan Joints in this application, they were adopted for 3 and 4-inch lines for the same purpose. In addition, by placing regulators, gauges and other recording equipment on a bridge using Chiksan Joints, accurate readings of the instruments could be obtained.

Since 1946, not one of these Chiksan Joints has been replaced or even repacked, and they are giving the same economical, dependable service they did when first installed.

In Texas or California — all over America and all around the world — wherever production, processing or distribution depends on the flow of liquid or gas or on the dependability of hydraulic systems, there you will find Chiksan Ball Bearing Swivel Joints on the job — adding muscle and flexibility — cutting down on shut-downs and maintenance.

Whatever your business, if gas or liquid plays a part, Chiksan's Research and Development Division can help you add efficiency, safety and economy to your operation.

Representatives in Principal Cities
Write for Catalog 53-C, Dept. 1-WO

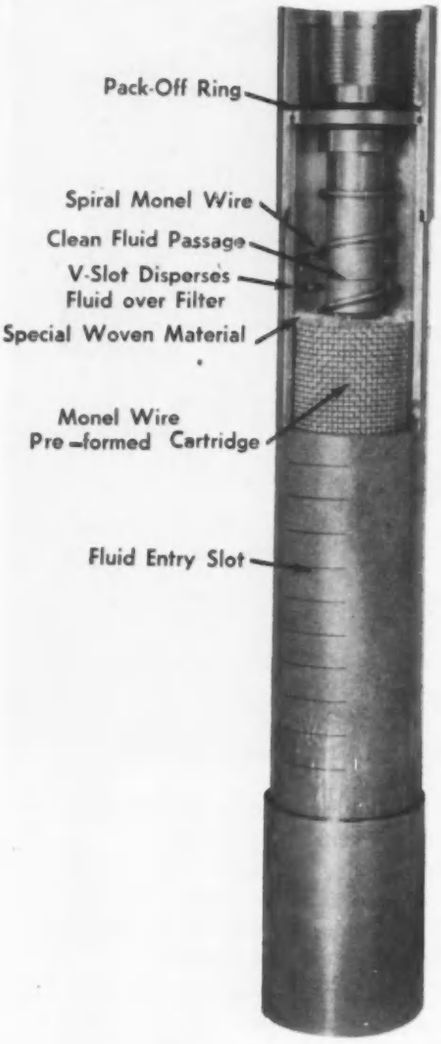


CHIKSAN Ball Bearing Swivel Joints are THE NEW TOOL of Modern Industry — with full 360° rotation in 1, 2, and 3 planes. Over 1,000 different types, styles and sizes have been developed for pressures and services from 28" vacuum to 15,000 psi and for temperature ranges from minus 75° to a plus 500° F. with packing materials for each specific type of service.

The Flow of Enterprise Relies on **CHIKSAN** *Ball-Bearing Swivel Joints*

CHIKSAN TRADE MARK REG.

CHIKSAN COMPANY • BREA, CALIFORNIA • Chicago 28, Illinois • Newark 2, New Jersey
Well Equipment Mfg. Corp. (Division), Houston 1, Texas • Chiksan Export Company (Subsidiary), Brea, California • Newark 2, N. J.



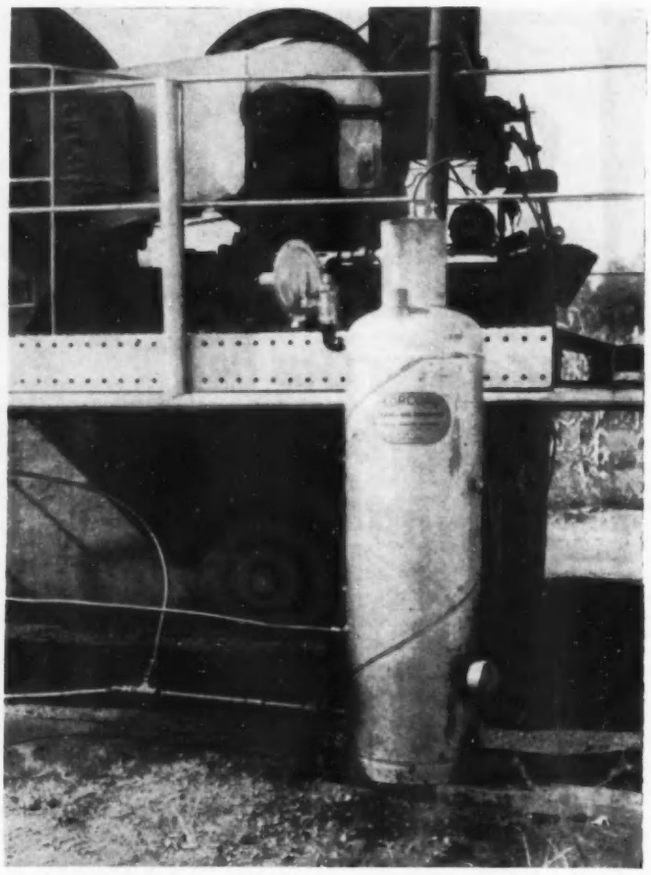
of an inch in width depending upon the gravity of fluid in the well. The inside surface of the slot has been flared with a V-slot allowing the well fluid to disperse evenly over the filter cartridge inside the tube.

The cartridge is fabricated with a monel mesh wire which fits against the inside of the tubular good while a second wire fits around the fresh oil passage tube. The space between the two wires has been preformed and filled with a special woven material which has high porosity, the strength of steel, acid-resistant and is guaranteed against matting. This filter cartridge is designed to be serviced at a nominal fee and the cartridge can be replaced.

A spiral three-sixteenths-inch monel wire is wrapped around the inner tube to keep the cartridge suspended. This angular space allows the free passage of fluid. The new filter may be obtained in various sizes, and special metals may be obtained on special order.

Circle No. 12 on Postcard

Fuel Gas Separator



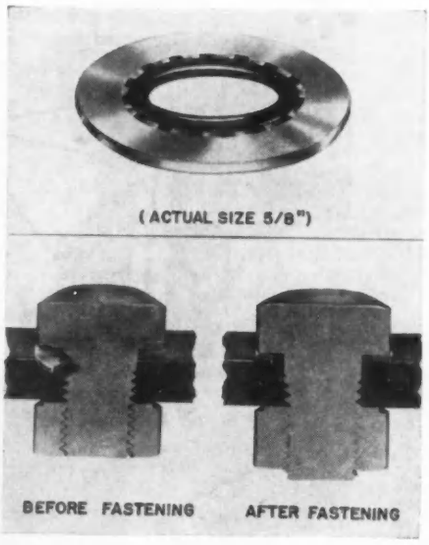
The new Torcome differential flow liquid gas separator utilizes heat from the engine exhaust to separate out adequate fuel gas for the pumping unit engine. This device provides fuel for the engine powering pumping wells which do not produce sufficient gas for a dependable fuel supply, or on wells which only occasionally make sufficient gas for engine fuel.

A portion of the produced liquids is forced into the fuel gas separator by the differential pressure created by an orifice in the flow line. Since the pressure on the downstream of the orifice is less than the upstream pressure, some of the oil will flow through the separator. In the separator, the oil comes in contact with a heat exchanging element which carries exhaust gases from the pumping unit engine. By adding heat to the oil, the lighter hydrocarbon ends in the form of gas are stripped from the crude oil. Gas is trapped in the top of the separator and pressure is reduced to a few ounces. Fuel costs on wells previously using gasoline or butane have been reduced from 75 to 100 percent. The device has been used on single and multi-cylindered engines, on low and high gas-oil-ratio wells, and on wells that produce some water.

Circle No. 13 on Postcard

Sealing Device

A new sealing device for sure sealing of bolts and studs at either high or low pressure, gas liquids or air has been developed by Franklin C. Wolfe Company. Called the Stat-O-Seal, this new device uses the principle of controlled confinement of the sealing gland as proved in the company's Lock-O-Seals. The Stat-O-Seal is one piece construction and non-directional. It cannot be assembled upside down. The O ring sealing gland in the Stat-O-Seal is mechanically fastened to the metal retainer which eliminates the possibility of failure of a chemical bonding agent. Use of the Stat-O-Seal eliminates the need for sealing "goop" over bolts and studs. They do not require high fastening torques to seal as there is always full metal to metal contact without any load transference to the sealing gland.



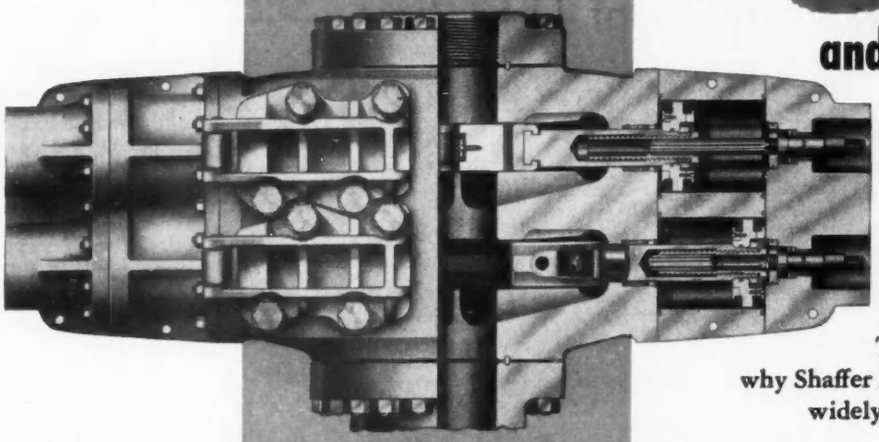
Circle No. 14 on Postcard

Save time! Keep informed! Circle numbers on postcard, page 241

When buying cellar control gates . . .

Get ALL the facts . . .

and you'll get SHAFFER!

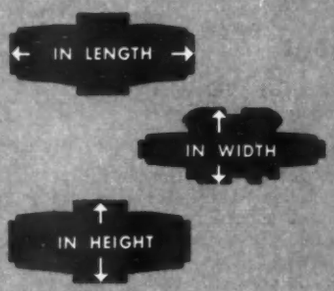


When you buy cellar control gates, it pays to *double*-check the features built into the various units you are considering. Here at Shaffer we not only welcome your making such a comparison – we strongly *urge* you to do so. This way you will appreciate more fully why Shaffer Hydraulic Cellar Control Gates are so widely recognized as the finest in the industry.

For Example . . .

take

Compactness



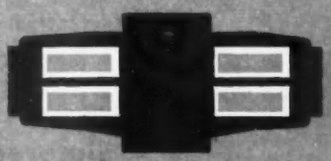
Shaffer Hydraulic Cellar Control Gates are not only unusually compact – in height, width, length – but equally important, you don't have to allow *extra* space above them for changing rams – nor do you have to allow extra space at both ends of the gate for expanding the unit to remove and replace rams.

Rams in Shaffer Hydraulic Gates are quickly changed through patented side-opening doors. Simply unbolt and swing open the door . . . change rams . . . and bolt the door shut again. Closing the door automatically aligns the rams within the gate. Even in sizes as large as 13⅜" (12" Series 900) the gate height is only 30" – and this is *total* required height – *no extra space need be allowed for servicing the rams!*

---

and

Convenience

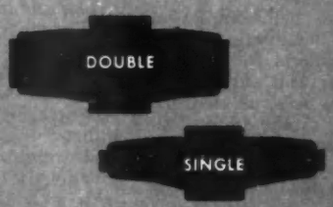


With Shaffer Hydraulic Gates there's no need to dismantle the upper unit in order to change rams in the lower unit. You can change rams in *either* unit without in any way disturbing or disconnecting the *other* unit. Each is completely independent of the other – a valuable safety, as well as time-saving, feature!

---

and

Versatility



Only Shaffer provides a choice of either Single or Double Hydraulic Gates – whichever best meets your requirements. Rams and most other parts are interchangeable, size for size, between Single and Double Gates, assuring you maximum adaptability to *your particular needs* – at minimum inventory and maintenance costs.

---

and

Dependability

Every model of Shaffer Cellar Control Gates has been *field-proven* under widely-varying types of operations and different field conditions. Get Shaffer Hydraulic Gates for the safety and all-around pressure protection so vital in cellar control gates!

The above are only a few of the MANY important advantages you get in Shaffer Hydraulic Cellar Control Gates. We'll gladly supply further details direct – or see your nearest Shaffer representative.

Send for your free copy of the latest Shaffer Catalog!

Remember Shaffer also manufactures a complete line of *Mechanical* Cellar Control Gates—both Single and Double Types—for those desiring this type of equipment. Rams are interchangeable, size for size, with those in Shaffer Hydraulic Gates.

See the Shaffer section, pages 4611 to 4686, of your 1953 Composite Catalog!

30 years OF OIL TOOL LEADERSHIP

SHAFFER

HIGH PRESSURE DRILLING AND CONTROL EQUIPMENT • FISHING TOOLS THAT EXCEL

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HOUSTON, TEXAS, 6006 Navigation Blvd. • ODESSA, TEXAS, 1925 West Second Street
OKLAHOMA CITY, OKLAHOMA, Acme Oil Tool Company, 1001 S. E. 29th STREET
FARMINGTON, NEW MEXICO, Shaffer Tool Works, Post Office Box 546
CASPER, WYOMING, Shaffer Tool Works, Post Office Box 1788
EXPORT SALES OFFICE: Shaffer Tool Works, 500 Fifth Avenue, New York, N. Y., U.S.A.

New Catalogs and Equipment Literature

Jet Cutter

A new technical bulletin on the bottom hole jet cutter, a special tool for fragmentizing junk, lost tools etc., in a well, has been published by the McCullough Tool Company. Features of these explosive, electric wire line jet cuttings tools are described and illustrated. Actual field reports showing the uses, applications and successful job accomplishments are included. Operation and detailed specifications are also given.

Circle No. 15 on Postcard

LP-Gas Valves

The Fairbanks Company has announced the publication of a brochure describing the complete selection of Fairbanks new LP-gas valves. Construction details, basic specifications, and valve applications are furnished for the bronze globe, angle, check, spring-loaded check and gate valves which have the Underwriters' Approval for LP-gas service and carry the required 400 pound w.o.g. pressure rating and LPG-FU body markings.

Circle No. 16 on Postcard

PERFORATE TUBING IN THE WELL

KINLEY TUBING PERFORATOR

M. M. Kinley Company Licensees

BEAUMONT
Associated Engineers, Inc. 5-7046, ZF 8-2023
CASPER
Wire Line Service 3-5264
CORPUS CHRISTI
Tubokut Wire Line Service 5-1811
Tuboscope 3-3512, 4-3137
HOBBS
Cecil Horne 3-5396
HOUSTON
Tuboscope JU-0577, MO-4279
KILGORE
Tuboscope 5198, 5218
MIDLAND
Luccous 4-8471, 4-4320
NEW IBERIA
Tuboscope 2-3831, 4-1327
NEW ORLEANS
Associated Engineers, Inc. AU-7696
OKLAHOMA CITY
Rainbo Service Co. . . . ME 4-2131, ME 2-2024
SHREVEPORT
Tuboscope 2-5663

Liquid Gravitometer

A new gravitometer that transmits accurate specific gravity records at any distance in feet or miles is described in the new American Recording Chart Company literature. The Arcco-Anubis metameter recording and transmitting liquid gravitometer incorporates a metameter telemeter system that records readings by electrical impulse. Private wires, telephone circuits, carrier channels or radio may be used as a connecting line, and accuracy is unaffected by characteristics of the transmitting circuit or channel.

Circle No. 17 on Postcard

Heating Equipment

A four page bulletin covering the complete line of tank car heaters, bituminous boosters, peak-temp oil boosters, deuce-combination tank car heaters and pumping boosters, and mobile, portable and stationary boilers has been issued by the Cleaver-Brooks Company. This new bulletin contains illustrations of the products in use along with brief descriptive copy and specifications. Typical installation pictures show the use of these Cleaver-Brooks units for heating, for pile driving, for bitumen and road oil heating in tank cars and storage asphalt plants, for ready mix concrete plants, aggregate drying, cold weather construction operation and the curing of concrete block and concrete cast products.

Circle No. 18 on Postcard

Rotating Scratchers

B and W Incorporated, well completion specialists, have released a bulletin on the B and W rotating scratchers for placing cement plugs. Operation and installation information are given as well as descriptions, pictures and price of the item. The company also has published in folder form an article, "Open Hole Cement Plugs," by a B and W employe discussing use of the equipment.

Circle No. 19 on Postcard

Furnace and Oven Control

A new expanded catalog of complete control systems for furnaces, ovens, dryers and kilns has been announced by The Bristol Company. The book contains the detailed engineering specification and prices necessary to choose and order the proper control "package" for a particular installation. Several models of the electronic dynamaster potentiometer and millivoltmeter type pyrometer controllers, recorders and indicators as well as bulb and tubing recording or controlling thermometers are illustrated. Essential accessories, such as charts, scales, thermocouples, bulbs and tubing, switches, panels and combustion safeguards are included to complete the list of requirements for any type electric or fuel-fired heating application.

Circle No. 20 on Postcard

Rental Tools

A booklet of rental prices and hand book engineering data for rental tools is available from Associated Oil Field Rentals. The 63-page book contains dimensional and engineering data on blowout preventers, tool joints, casing, kellys, tubing and drill pipe. Terms, conditions and prices of tool rental are given and other useful information such as drill collar weights per foot and drill bit specifications are contained in the book.

Circle No. 21 on Postcard

Drill Collars

A new bulletin covering The National Supply Company's complete Ideal line of drill collars has been released. Sizes, a picture review of the processes and accurate controls used to manufacture Ideal drill collars, and complete torque charts to assist in field make-up of collar and joints are included in the bulletin.

Circle No. 22 on Postcard

Sintered Carbide Check Valves

Complete specifications with operational performance are given in a new bulletin on sintered carbide balls and seats issued by Kennametal Inc. Two types of API balls and two different types of API seats are described and information on the new lightweight titanium carbide Kennametal ball weighing one-third less than steel is given. Also discussed in this new bulletin is a new valve seat construction which embodies a monel metal rib on a solid sintered carbide seat.

Circle No. 23 on Postcard

Steel and Aluminum Equipment

A new catalog has been published by the Precision Equipment Company. New items have been added to Precision's standard line consisting of steel shelving, lockers, ladders and other storage and maintenance equipment for industrial and institutional use. Each item is illustrated and priced. Cartoons by nationally famous cartoonists are included throughout the publication.

Circle No. 24 on Postcard

Circle numbers on postcard, page 241

Chem Lab offers...

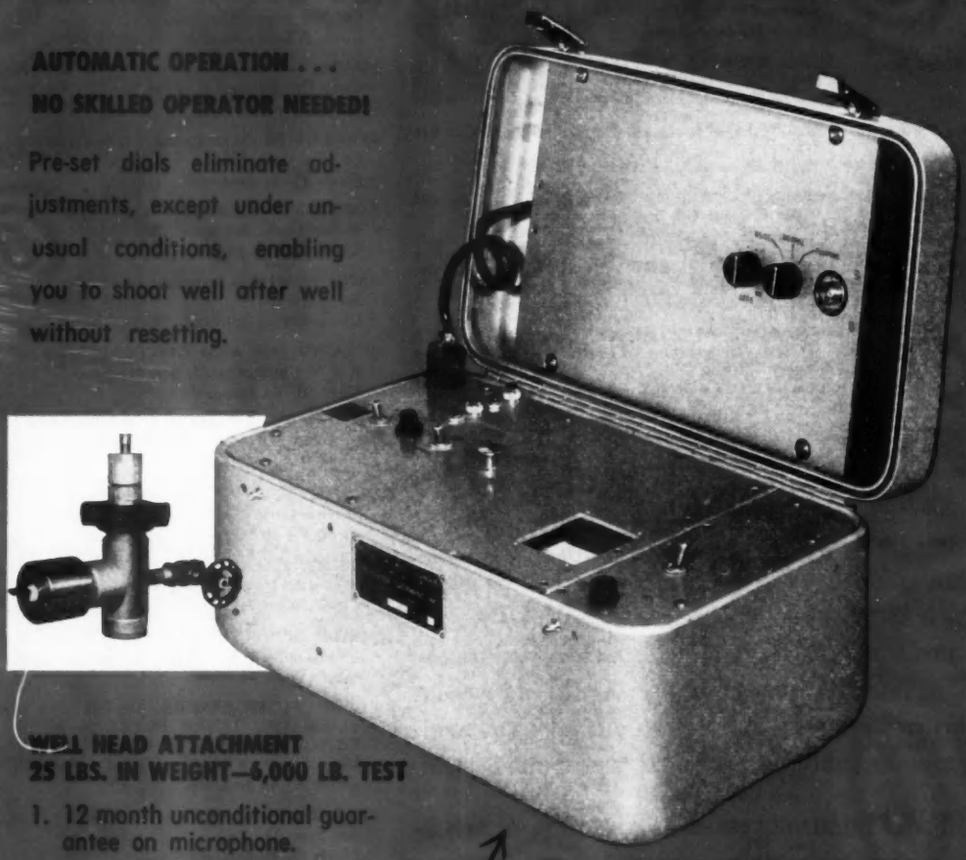
NEW-IMPROVED
Acoustical Well Sounder

(Fluid Level Recorder)

SAVES TIME — MONEY — OPERATIONAL COSTS

AUTOMATIC OPERATION . . .
NO SKILLED OPERATOR NEEDED!

Pre-set dials eliminate adjustments, except under unusual conditions, enabling you to shoot well after well without resetting.



WELL HEAD ATTACHMENT
25 LBS. IN WEIGHT—5,000 LB. TEST

1. 12 month unconditional guarantee on microphone.
2. Firing mechanism easily disassembled for cleaning.

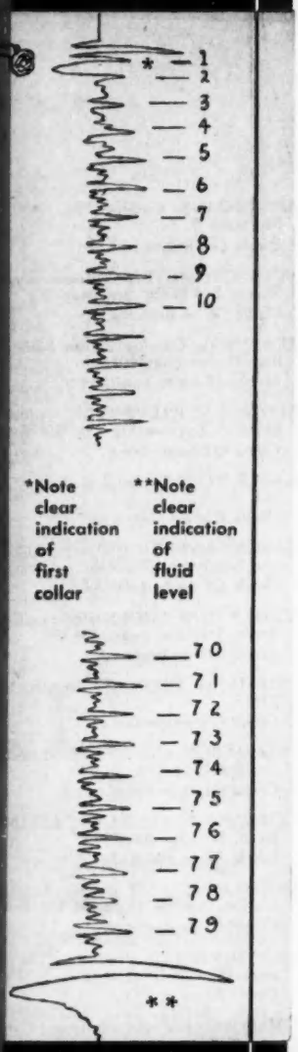
WEATHER PROOF! WILL FLOAT!

Can be made submersion proof on order.

AMPLIFIER-RECORDER
ONLY 30 LBS. IN WEIGHT

A single compact unit in a 16"x9"x8" aluminum case. Plug in construction for ease of repair. Maintenance is reduced to a minimum. Power—6 volt automobile battery.

from top



*Note clear indication of first collar

**Note clear indication of fluid level

to bottom

A PERFECT LOG . . .

New design eliminates need for dual trace recording.

Routine recordings at 9,000 feet.

Chemical & Geological Laboratories are the distributors for the Rocky Mountains for lease and/or sale on Associated Equipment, Inc.'s Acoustical Well Sounder (fluid-level recorder). Chemical & Geological Laboratories offers, through their Engineering Department, fluid well determinations. Prices quoted on request. Parts and supplies are carried at Casper for the convenience of the industry.

CHEMICAL & GEOLOGICAL LABORATORIES

Laboratories at Casper, Midland, Glendive, Edmonton, Calgary and Regina

Catalogs AND EQUIPMENT *Literature* OFFERED IN THIS ISSUE'S ADVERTISEMENTS

Copies may be obtained easily and without cost by using the Reader Service Postcard on Page 241. Just circle on the card the number at the end of each item in which you are interested.

API CHAINS—Catalog No. 2480. Link-Belt Co. See page 5.
Circle L6 on postcard.

ATTRACTOMETER—Information. Geophysical Survey Syndicate. See page 282.
Circle G6 on postcard.

BEARINGS—Catalog. Aetna Ball and Roller Bearing Co. See page 101.
Circle A5 on postcard.

BLOWOUT PREVENTER—Information. Regan Forge & Engineering Co. See page 266.
Circle Q2 on postcard.

CABLE TOOLS—Catalog. Spang & Co. See page 283.
Circle R10 on postcard.

CASING AND TUBING—Booklet. Republic Steel Co. See pages 280-281.
Circle Q4 on postcard.

CEMENTING SHOES—Information. Baker Oil Tools, Inc. See pages 138-139.
Circle B10 on postcard.

CHEMICAL FEEDERS—Details. Manzel. See page 276.
Circle L10 on postcard.

CORROSION INHIBITOR—Literature. Armour & Co. See page 195.
Circle B4 on postcard.

CORROSION RESISTANT LINING—Data. Tube-Kote, Inc. See page 144.
Circle S9 on postcard.

COUPLINGS AND HOSE ASSEMBLIES—Information. Anchor Coupling Co. See page 31.
Circle B3 on postcard.

DEPTHOMETER—Bulletin. The Cavins Co. See page 196.
Circle E3 on postcard.

DRAWWORKS—Information. Cardwell Manufacturing Co. See pages 62-63.
Circle D8 on postcard.

DRILL COLLARS—Data. Baash-Ross Tool Co. See page 65.
Circle B8 on postcard.

DRILLING AND FISHING TOOLS—Catalog. Acme Fishing Tool Co. See page 128.
Circle A1 on postcard.

DRILLING BITS—Catalog. Herb J. Hawthorne, Inc. See page 90.
Circle H7 on postcard.

ELECTRIC MOTORS—Information. Wagner Electric Corp. See page 193.
Circle T7 on postcard.

ENGINES, GAS, DIESEL—Bulletin 1560. Waukesha Motor Co. See page 47.
Circle T9 on postcard.

GAUGES—Information. Jas. P. Marsh Corp. See page 30.
Circle M2 on postcard.

GRAVEL PACK—Information. The Layne and Bowler Co. See page 265.
Circle L4 on postcard.

HYDRAULIC CELLAR CONTROL GATES—Catalog. Shaffer Tool Works. See page 249.
Circle R5 on postcard.

HYDRAULIC JACKS AND PULLERS—Information. Templeton, Kenly & Co. See page 142.
Circle S2 on postcard.

HYDRO-SPRING TESTER—Information. Halliburton Oil Well Cementing Co. See page 137.
Circle H5 on postcard.

JUNK BASKET—Details. S. R. Bowen Co. See page 262.
Circle D1 on postcard.

OIL THIEF—Literature. Protek Specialty Co. See page 222.
Circle P8 on postcard.

OIL-WELL CEMENT—Information. Universal Atlas Cement Co. See page 38.
Circle T1 on postcard.

PACKAGED COMPRESSOR PLANTS—Information. The J. B. Beaird Co. See page 187.
Circle C2 on postcard.

PACKINGS, PISTON RINGS AND VALVE DISCS—Information. France Packing Co. See pages 222 and 288.
Circle G1 on postcard.

PERFECT SEAL UNIONS—Catalog 11. Catawissa Valve & Fittings Co. See page 261.
Circle D10 on postcard.

PERFORATORS—Booklet. McCullough Tool Co. See page 289.
Circle M4 on postcard.

PIPE COUPLINGS—Folder. Gustin-Bacon Manufacturing Co. See page 215.
Circle H3 on postcard.

PIPE COUPLINGS—Catalog No. 44-81. Victaulic Company of America. See page 149.
Circle T3 on postcard.

PIPELINE ENAMELS—Literature. Pittsburgh Coke & Chemical Co. See page 214.
Circle P6 on postcard.

PLASTIC PIPE—Information. Carlon Products Corp. See page 269.
Circle D9 on postcard.

PLUNGERS—Catalog. John N. Martin, Mfr. See page 194.
Circle M3 on postcard.

PLUNGERS—Technical Bulletin No. 201. Pacific Pumps, Inc. See page 275.
Circle N10 on postcard.

PREFABRICATED HOMES—Specifications. Houston Ready-Cut House Co. See page 222.
Circle H9 on postcard.

PREFABRICATED HOUSES—Information. Southern Mill & Manufacturing Co. See page 267.
Circle R9 on postcard.

PRESSURE STORAGE TANKS—Information. The J. B. Beaird Co. See page 188.
Circle C3 on postcard.

PUMPING JACKS—Information. Jensen Bros. Mfg. Co. See page 190.
Circle J6 on postcard.

PUMPING UNITS—Information. The Pelton Water Wheel Co. See page 163.
Circle P3 on postcard.

PUMPS—Bulletin 531. Ajax Iron Works. See page 175.
Circle A7 on postcard.

PUMPS—Information. The Aldrich Pump Co. See page 191.
Circle A8 on postcard.

PUMPS—Information. The New York Air Brake Co. See page 245.
Circle N2 on postcard.

PUMPS, MOTORS AND CONTROLS—Information. The Denison Engineering Co. See page 284.
Circle F6 on postcard.

ROD PUMPS—Information. Harbison-Fischer Mfg. Co. See page 183.
Circle H6 on postcard.

ROTATING SCRAPERS—Information. J. M. Huber Corp. See page 290.
Circle H10 on postcard.

SAND PUMPS—Literature. Miller Sand Pump Co. See page 192.
Circle M6 on postcard.

SCRATCHERS AND CENTRALIZERS—Ruler. B & W Incorporated. See page 150.
Circle B7 on postcard.

SEAMLESS PIPE AND TUBES—Bulletin No. 15. National Tube Division. See page 14.
Circle N1 on postcard.

SEISMIC SERVICE—Information. Seismograph Service Corp. See page 79.
Circle R4 on postcard.

SEISMOMETERS—Bulletin DL-G 300. Texas Instruments Inc. See page 240.
Circle S4 on postcard.

SHALE SEPARATOR AND SHAKER—Information. Thompson Tool Co. See page 111.
Circle S6 on postcard.

SLUSH PUMP LINERS, PACKING ASSEMBLIES AND LINER PULLERS—Catalogs No. P-120, P-121 and P-122. Oil Well Manufacturing Corp. See page 279.
Circle N5 on postcard.

SPUDDERS—Information. Bucyrus-Erie Company. See page 35.
Circle D2 on postcard.

SUCKER RODS—Information. The S. M. Jones Co. See page 177.
Circle J9 on postcard.

SWIVEL JOINTS—Catalog 53-C. Chiksan Company. See page 247.
Circle E6 on postcard.

THREAD LUBRICANT AND SEAL—Details. Jet-Lube, Inc. See page 292.
Circle J7 on postcard.

TRANSMISSIONS—Information. Turner Uni-Drive Co. See page 219.
Circle S10 on postcard.

TRAVELING BLOCKS—Catalog. McKissick Products Corp. See page 274.
Circle M5 on postcard.

TUBING SPIDER—Bulletin TS-54. Advance Oil Tool Co. See page 196.
Circle A3 on postcard.

WEED KILLER—Literature. Pacific Coast Borax Co. See page 220.
Circle N9 on postcard.

SEAMLESS TUBE MILL

Now from the heart of a rapidly developing oil and gas region the new CF&I Seamless Tube Mill becomes a source of supply for Seamless Oil Country Tubular Goods. From the precision controlled piercing and rolling mills to the finished product . . . each step of production is maintained under rigid control, assuring the same high standards of quality demanded of every CF&I product.

CF&I Seamless Oil Country Tubular Goods meet all API STD 5A specifications and are available in sizes ranging from 2⅜" O.D. through 9⅝" O.D. Specify CF&I for top quality Seamless Oil Country Tubular Goods.

CF & I TUBULAR PRODUCTS

THE COLORADO FUEL AND IRON CORPORATION

Denver, Colorado

2068

What's Happening

AMONG MEN IN THE INDUSTRY

Lester B. Swan, formerly assistant general manager of Dowell Incorporated of Tulsa, has been appointed executive vice president of the Brazos Oil and Gas Company. Swan will be responsible for overall direction of Brazos Oil and Gas Company's operations and will make his headquarters in the firm's Houston office. Brazos Oil and Gas, a subsidiary of The Dow Chemical Company, is engaged primarily in petroleum exploration. Swan was formerly with Stanolind Oil and Gas Company, beginning his career in the oil industry there in 1936. He joined Dowell in 1940, became assistant district manager in 1947 and was appointed manager of the New Orleans district when it was organized in February, 1948. Later he served to Dowell's overseas associate, United Oilwell Service, and returned to Dowell in early 1952. Swan was put in charge of coordinating the company's research program.

Lester B. Swan

•

Joseph C. Kitchens has resigned as district geologist for The Pure Oil Company at Tyler, Texas, to open a district geological office for the Three States Natural Gas Company in Tyler.

•

Lee J. Thronson has joined the staff of Oil and Gas Property Management, Inc. in Dallas as manager of drilling and production operations. Formerly he was associated with Mendota Oil Company in Fort Worth as manager of production. A graduate petroleum engineer, Thronson was associated with Sun Oil Company's Dallas division from 1938 until 1952, serving as district engineer at McAllen and Corpus Christi and as production superintendent at Premont, Texas.

•

W. Farrin Hoover, consulting geologist, has announced the opening of his new office at 629 Kittredge Building, Denver, for geological service to the independent producer.

•

G. P. (Tige) Brown has resigned as manager of the Land department of Pan-Am Southern Corporation, with which he has been associated for the past 18 years, to enter the oil business in Shreveport as an independent.

•

Rex E. Cheek, formerly with Stanolind Oil and Gas Company, and **Taber de Polo,** formerly an independent contractor, have joined Max W. Ball and Douglas Ball in consulting practice. Hereafter the firm will operate as Ball Associates, oil and gas consultants, in Washington, D. C.

•

Glen R. Harsh of Bartlesville, Okla., has been named manager of the Oil Production department of Cities Service Petroleum Inc. to succeed **J. E. Heston,** recently elected vice president and director of Cities Service Oil Co. (Del.) with headquarters in Bartlesville. Harsh became associated with Cities Service in 1924 at Eldorado, Kansas, working in various capacities in the field. In 1944 he served as assistant superintendent of oil production in the Gulf Coast and Lindsay, Okla., areas; and in 1948 was appointed superintendent for South Oklahoma and North Texas. In 1951 he was named assistant general superintendent of the oil production division of Cities Service Oil Co. (Del.) with headquarters in Bartlesville.

•

Louis H. Klinzing has retired as senior petroleum engineer for Stanolind Oil and Gas Company at Tulsa. He served with the company 25 years, starting his career with Midwest Refining Company, later acquired by Stanolind.

•

Melvin X. Hobbs, Jr., formerly with The Texas Company at Premont, Texas, has joined Texas Gas Corporation as an engineer in the Houston office.

•

J. P. Straight has been appointed assistant general superintendent of oil production for Cities Service Oil Company with headquarters in Bartlesville, Okla. Straight, who has been superintendent of oil production for the Gulf Coast division in Houston, succeeds **Glen R. Harsh.** Straight joined Cities Service in 1929 as a geological scout. He was with Emark Drilling Company, Cities Service subsidiary, in the East Texas field until 1932, when he was named district superintendent of oil production in the East Texas area. He was named assistant division superintendent for the East Texas and Gulf Coast areas in 1943 and Gulf Coast superintendent early this year. Replacing Straight will be **F. D. Priebe,** formerly district superintendent at Odessa, Texas. **Don Kastner,** district engineer at Odessa, will become superintendent and **Max Bolick,** assistant production foreman at Odessa, becomes district engineer. **Albert P. Coe, Jr.,** assistant production foreman at Eunice, N. M., is transferred to Odessa succeeding Bolick. **R. P. Hemphill,** assistant production foreman at Hobbs, N. M., replaces Coe at Eunice and **S. E. Woodruff** of the Natural Gas Division at Liberal, Kansas, becomes assistant production foreman at Hobbs.

•

R. F. Rood has been appointed division landman of the northeast division of Phillips Petroleum Company, which includes districts headquartered at Ardmore and Oklahoma City, Wichita, Kansas; and Evansville, Ind. Hood succeeds **J. S. Williams,** who will handle special work, reporting directly to **C. O. Stark,** vice president—land and gelogical department. **R. N. Richey** replaces Hood as division landman for the San Juan division.

•

W. C. Hawk of Oklahoma City, central region exploration manager for Continental Oil Company, has been promoted to manager of the company's geological section with headquarters in Houston. **B. G. Swan,** Ponca City, assistant manager of the geological section, has been promoted to manager of the central region Exploration department at Oklahoma City succeeding Hawk.

Harlan H. Pigott, vice president—operations of the Equitable Gas Company of Pittsburgh for more than three years, has been elected president of the Carnegie Natural Gas Company and Appollo Gas Company, Pittsburgh. Pigott began his experience in the oil and gas business as an independent producer in Kansas, Oklahoma and Texas. Later he was connected with the Muskingham Oil and Gas Company at Marietta, Ohio. Pigott joined Equitable Gas in 1927 and was appointed general superintendent of production ten years later. In 1942 he was named operating manager of the Equitable Gas properties and in 1950 was advanced to the position he is now vacating.

Harlan H. Pigott

•

C. A. Jackson, assistant to the president of The Ohio Oil Company, has been appointed treasurer of the company. He will succeed **J. R. Donnell,** who has been appointed assistant manager of the company's new Supply and Transportation department. **G. H. Young,** presently assistant retail sales manager, will become assistant to the president succeeding Jackson. The Treasurer's department will become a part of the Financial department under **H. C. King,** vice president.

•

Robert W. Hendee, president of Colorado Interstate Gas Company since 1943, has resigned and is being succeeded by W. E. Mueller, executive vice president since September, 1952. Hendee will continue as a member of the board of directors and will serve as a consultant to company management. Hendee will be available to other natural gas companies and expects to establish an office in Colorado Springs, Colo. Mueller was a senior vice president and director of the Tennessee Gas Transmission Company in Houston before joining Colorado Interstate in 1952.

•

Frank Searcy and **L. E. Whitehead,** both of Ponca City, division superintendents in Continental Oil Company's geophysical section, have been named assistant managers of the geophysical section. They will continue to make their headquarters at Ponca City.

•

A. E. Brainerd, formerly Rocky Mountain regional geologist for Continental Oil Company, and **Dr. F. M. Van Tuyl,** for many years head of the Department of Geology at the Colorado School of Mines, announce the opening of offices in Denver and Golden as consultants in petroleum and engineering geology.

ANOTHER OUTSTANDING NAME ADDED TO THE WILSON SUPPLY COMPANY LINE OF PROVEN OILFIELD SUPPLIES and EQUIPMENT

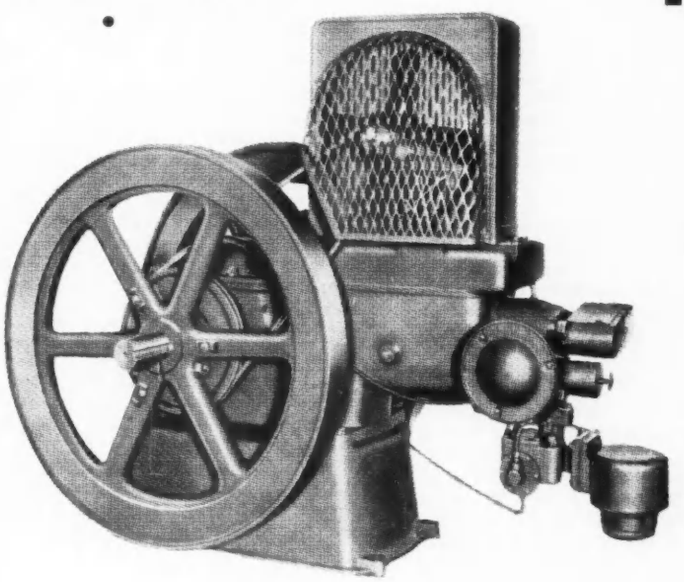
FAIRBANKS-MORSE

a name worth remembering when you want the best

For more than 30 years The Wilson Supply Company has served the Oil Industry in the Gulf Coast area with equipment and supplies from the leading manufacturers of the country. Oil field products of Fairbanks, Morse & Company are favorably known throughout the Industry, and are now available through all 16 Stores of Wilson Supply Co.

- **ENGINES**
- **ROTARY PUMPS**
- **DIESEL ENGINES**
- **ELECTRIC MOTORS**

THE ZC ENGINE



Designed for Better Pumping Service

Here is the best Engine on the market for pumping your well. Features of the ZC slow speed, horizontal heavy duty Engine are:

- VAPOR COOLING
- ROLLER BEARINGS—LONG LIFE
- EXTRA HEAVY FLYWHEELS
- SELF OILING—FULLY ENCLOSED
- EASY STARTING
- GASOLINE CARBURETOR
- GREASELESS CLUTCH WITH BUILT IN SHIFTER

ZC Engine operators have learned by experience to fully appreciate the many desirable features of these engines. They have discovered that the "ZC" will do a better job at less cost than many higher priced pumping engines. They know about the trouble-free cooling system—about the easy starting—even on the coldest mornings, and about the low oil consumption and fuel economy.

WILSON SUPPLY COMPANY

BRANCH STORES

TEXAS—Alice, Corpus Christi, Victoria, Bay City, Columbus, Barbers Hill, Liberty, Beaumont, Kilgore, Monahans. LOUISIANA—Lake Charles, New Iberia, Houma, Harvey, Shreveport.

1301 Conti St. (Cor. of Walnut)
HOUSTON, TEXAS

SALES OFFICES

Tulsa
Dallas
Corpus Christi
New Orleans
Shreveport
Lake Charles

CUT STUCK SAND LINES IN THE WELL

KINLEY SAND LINE CUTTER

M. M. Kinley Company Licensees

ABILENE, TEXAS
Hudson-Eads, Inc. - - - - - - - - - 2-5331
CORPUS CHRISTI
Tubokut Wireline Services - - - - - - 5-1811
Tuboscope - - - - - - - - - 4-3137, 2-1242
Wireline Specialties Co. - - - - - - 3-2196
HOBBS
Horne Well Service Co. - - - - - - - - 3-5396
HOUSTON
Adair Service Co. - - - - WE-6497, PR-4652
Tuboscope - - - - - - - - JU-0577, MO-4279
MIDLAND
Luccous - - - - - - - - - - 4-8471, 4-4320
NEW IBERIA
Tuboscope - - - - - - - - - - 1411, 3210-W
OKLAHOMA CITY
Rainbo Service Co. - ME 4-2131, ME 4-4555
WICHITA FALLS
Hudson-Eads, Inc. - 2-3767, 2-8584, 3-4690

SECONDARY MODERN RECOVERY

TECHNICAL CONSULTING PRODUCTION ENGINEERING SERVICE, INCLUDING CORE ANALYSIS

PRESSURE MAINTENANCE WITH GAS OR WATER

REPRESSURING WITH GAS OR WATER

Salt Water Disposal Equipment

Archer County, Texas

SURVEYS
ESTIMATES
DESIGN
INSTALLATION
SUPERVISION

PETROLEUM ENGINEERS
CABLE ENGINEERING
WICHITA FALLS, TEXAS

Richard M. Holland has resigned as chief geologist for the J. S. Abercrombie Company, Houston, to open his own office as a consulting geologist in the City National Bank Building, Houston. Before his employment with the Abercrombie Company, Holland was a senior geologist with Sinclair. He will specialize in geological interpretations, evaluations, management and supervision.

•

Neal Clayton has resigned as assistant domestic manager of Century Geophysical Corporation, Tulsa, and has organized the Liberty Exploration Company, of which he is president. The new company will maintain general management and interpretation offices at 1307 East 38th street, Tulsa, and a business office at 2518 Drexel Drive, Houston. Besides general geophysical contract work, Clayton will also engage in private consulting work.

•

Henry Waszkowski, Jr., has been appointed assistant to the coordinator of domestic production for Socony-Vacuum Oil Company, Inc. For 14 years Waszkowski has been associated with Magnolia Petroleum Company, southwest affiliate of Socony-Vacuum, most recently as assistant superintendent of the producing district headquarters at Falfurrias, Texas.

•

Eugene Holman, president, Standard Oil Company (New Jersey) has been presented the Captain Robert Dollar memorial award for distinguished services in behalf of foreign trade. James A. Farley, 1952 recipient of the award, made the presentation at the fortieth national foreign trade convention in New York sponsored by the National Foreign Trade Council.

•

Thomas F. Dowd, Jr. has been named treasurer of Vickers Petroleum Company. Formerly with Arthur Young & Co. and with Continental Oil Company, Dowd has been a special assistant to the comptroller for Socony-Vacuum Oil Co. in New York since 1952.

•

B. G. Swan, assistant manager of Continental Oil's geophysical section at Ponca City, Okla., has been promoted to manager of the central region Exploration department and transferred to Oklahoma City. He succeeds **W. C. Hawk**, who has been promoted to manager of the company's geological section at Houston.

•

Ralph H. Akin, geologist at Shreveport, La., for The Carter Oil Company, has resigned to become a geological and geophysical consultant.

•

James A. Morris has opened new offices in Wichita, Kansas. Formerly Morris was with Petroleum Inc., and for the past year he has been an independent consulting geologist.

•

Walter N. Kellog, petroleum reservoir engineer of Sunray Oil Corporation, has been transferred to the Tulsa headquarters from San Antonio.

•

Frederic A. Bush, chief geologist for Sinclair Oil Corporation, has been transferred from New York to Tulsa, where he will direct geological, geophysical and exploitation activities for Sinclair Oil and Gas Company. Bush will be in charge of exploration in all states in which the company operates as well as in Canada.

•

Mike O'Donnell and **William R. Edmonson**, both with S. D. Johnson, Wichita Falls, Texas, oil operator, have resigned to form a partnership for oil operations in the Rocky Mountain region. They will have offices in Denver.

•

C. Herbert Griffin, Jr., former division superintendent at Casper, Wyo., for Phillips Petroleum Company, has joined R. L. Manning Company, drilling contractors at Denver.

•

Al McGregor, formerly with The Texas Company, has joined Ryan-Davis Oil Company, Denver, as chief geologist.

Transfers and Promotions . . .

The Sinclair Oil & Gas Company announced the following Production department transfers and promotions: T. C. Kadel, assistant district superintendent, Eldorado, Texas, transferred to Fort Morgan, Colo.; W. A. Russell, district foreman, Andrews, Texas, to Midkoff, Texas; C. J. Eskridge, district foreman, Odessa, Texas, to Andrews, Texas; F. F. Thomason, district foreman, Midkoff, Texas, to Odessa, Texas; J. F. Dobson, senior petroleum engineer, Ardmore, to Oklahoma City; Ralph R. Sotelo, senior clerk, Arp, Texas, to Tulsa; J. A. Moran, district foreman, Bairoil, Wyo., to Sand Draw, Wyo.; Roscoe C. Gillespie, assistant district foreman, Sand Draw, Wyo., reclassified intermediate petroleum engineer and transferred to Casper, Wyo.; R. W. Newport, district clerk, Big Spring, Texas, promoted to assistant division chief clerk and transferred to Midland, Texas.

•

Humble Oil & Refining Company announced the following changes regarding Production department supervisory personnel:
Earl Ott, roustabout gangpusher, Bayou Sale District, Louisiana Division, promoted to farm boss at the Grand Isle District; **Laurie M. Sloan**, district petroleum engineer at Friendswood in the Gulf Coast Division, transferred to the Petroleum Engineering Division, Houston, as senior petroleum engineer; **Ollie L. Canion**, assistant district chief clerk, transferred from the Government Wells District, Southwest Texas Division, to the Gas Division, Tomball Gas System; **L. B. Moore**, rotary driller, Grand Isle District, Louisiana Division, moved to Hobbs District, West Texas Division, as rotary driller; and **Ralph T. Russell**, assistant district chief clerk, transferred from the Stratton District in Southwest Texas Division to the Pickton District, East Texas Division.

•

Sinclair Oil and Gas Company, Tulsa, announces the following Production department transfers: **Chester R. Richards**, district foreman, Madison, Kansas, to Thrall, Kansas; **P. B. Wolfe**, district foreman, Nowata, Okla., to Madison, Kansas; **A. E. Ward**, district foreman, Thrall, Kansas, to Nowata, and **J. A. Robinson**, junior petroleum engineer, Nowata, to Carmi, Ill.

Pennington Receives Recognition Award

Harry Pennington, San Antonio oil producer and equipment designer, whose petroleum industry inventions and developments almost parallel in number his widely-recognized authoritative technical articles which appeared in WORLD OIL's predecessor, *The Oil Weekly*, has been awarded a citation for his development of the gas-oil ratio method—a standard of the industry today.

Celebrating the University of Michigan engineering centennial, the College of Engineering faculty awarded Pennington the citation October 23, 1953, at Ann Arbor.

In notifying WORLD OIL of this signal honor, Pennington said, "In this I think that you should share, by reason of having printed the serial on 'Proportion of Gas to Oil' (the gas-oil ratio), and thus paving the way for its reception by the oil industry throughout the world."

Pennington entered the oil business at Sour Lake in 1902. His first job: stacking pipe. Five months later he was reckoned a full-fledged driller. His meteoric rise included the acquisition of producing wells, and he accumulated a fortune before selling out and enrolling at the University of Michigan.

Before his college days began, he could point to many inventions, including a machine for winding wire on a sand screen, a turbine pump, a steam jack for pumping wells, and a setting tool that would set and seal a well without coming out of the hole.

After his graduation, Pennington held various engineering positions before entering the producing and leasing fields. He has held posts of honor and recognition throughout the oil industry, but it was for his gas-oil ratio development that he was awarded the University of Michigan College of Engineering honor "in recognition of his outstanding achievements and of his contributions to the development of the field of engineering."

DEATHS

James Melvil Shaffer, 83, pioneer oilman who helped develop the Drumright and Cushing oil fields, died at his home in Fort Worth December 7. Born near Oil City, Penn., Shaffer operated as a producer and drilling contractor in Ohio, Canada and Illinois. He resided in Drumright for many years and was active in the Drumright and Cushing fields, operating with his four brothers, in a partnership known as the Shaffer Brothers.

•

Herbert G. Naylor, 79, credited with being the oldest living member in point of service of the API, died December 5 in Denver. Formerly with Continental Oil Company, Naylor was vice president of Midwest Refining Company and when the firm was absorbed by Standard Oil of Indiana, Naylor became manager of the Bulk Sales department. He retired in 1939.

•

Mrs. LeVina Virtue Tibbens, 79, president of Tibbens Oil Company, died December 3 in Tulsa. Mrs. Tibbens became president of the firm founded by her husband, Charles Grant Tibbens, after his death in 1935.

•

Max R. Sheets, 43, supervisor for Engineering Industries Co. and Republic Exploration Co., died December 2 in Tulsa.

•

Tracy D. Brown, 70, president of Colson Oil Company, died in Tulsa November 26. Brown practiced law until 1929 when he formed the Colson firm. He was also a rancher.

•

Joe Ray, 74, independent oil operator of Chickasha, Okla., died November 14 in a Temple, Texas, hospital. Ray was the developer of the Carter-Knox pool southeast of Chickasha.

•

Robert Courtney Jones, 82, of Cushing, Okla., died November 20. Jones was founder of two oil companies at Cushing and at the time of his death was serving as president of Blackwell Oil and Gas Company and the R. C. Jones Oil Company. He also was treasurer of the Mul-Berry Oil Company, stepping down recently from the presidency of the company.

•

Harry J. March, vice president and director of the Signal Oil and Gas Company, died November 15 in Balboa, Calif. He was general counsel for the company and directed its legal activities.

•

Walter R. Trelford, 67, former general manager of Crude Oil department of Humble Oil & Refining Company, died December 6 in Houston. Trelford held that position for ten years prior to his retirement in 1945. He joined Humble in Fort Worth in 1919.

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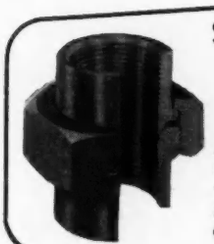

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Available with screwed or socket weld ends. 3000-lb. sizes ⅛" to 3"; 6000-lb. sizes ⅛" to 2".

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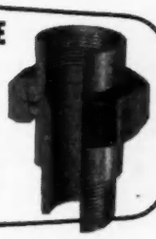

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What's Happening

AMONG INDUSTRY ASSOCIATIONS

District Vice Chairmen Of OIIC Announced

Election of two district vice chairmen for the Kansas-Oklahoma district of the Oil Industry Information Committee has been announced. Robert A. Douglass, regional manager for the Ethyl Corporation, Tulsa, has been named the new district executive vice chairman for the OIIC, succeeding James B. Smith, vice president, Sunray Oil Corporation, Tulsa, who resigned. Douglass formerly was OIIC district vice chairman in charge of the school program.

L. R. Kump, director of training for the Marketing department of the Continental Oil Company, Ponca City, succeeds Douglass as the OIIC district vice chairman for the school program.

Reverse Circulation

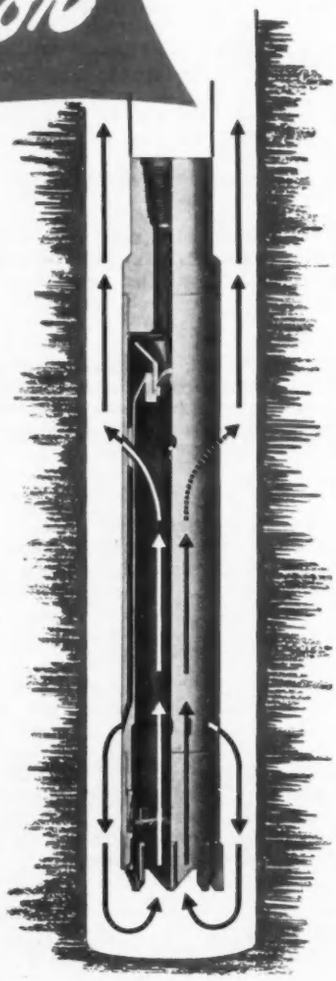
BRINGS IN JUNK!

By reversing normal circulation to literally pull objects into the basket, the BOWEN JUNK BASKET assures complete single-run recovery of all bottom hole junk.

Circulating fluid is diverted through side passages in the barrel and against the full circumference of the hole. Here the fluid is deflected, moving all objects toward center. Fluid flows in a continuous stream to the center of the tool and up through the barrel to return ports pulling all objects through the catcher. This reverse circulation action assures more complete recovery of junk in the hole and eliminates misruns. *Full pump pressure can be utilized* because there's no danger of pressure bearing against and causing loss of the fish.

Comes in sizes from 3¾" to 17½" and is engineered to recover all types of bit cones used to drill hole sizes within its range.

FOR DETAILS call the Bowen Service Store in your territory or write direct.



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NEW YORK CITY, NEW YORK
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Chicago Oil Men Name Ganley New President

William H. Ganley, Falley Petroleum Company, was elected 1954 president of the Chicago Oil Men's Club at the annual election held in December.

W. H. Ganley

Other officers chosen were Roy J. Thompson, Apex Motor Fuel Company, first vice president; Ray C. Duffett, The Globe Oil & Refining Company, second vice president; Bernard G. Ziv, Shell Oil Company, treasurer; and Walter F. Vogt, Standard Oil Company (Indiana), secretary.

New directors chosen were Gerald F. Tripp, Gustafson Oil Company, retiring 1953 president; Charles K. Haddon, Harry P. Dunn Company; P. Roger Girard, P. R. Girard Company; and O. R. Waller, Petroleum Marketer. Directors continuing in office are Henry G. Plane, Johnson Oil Refining Company; J. N. Waddell, Henry H. Cross Company; and Robert A. Zust, Cities Service Oil Company.

The Chicago Oil Men's Club has more than 600 members from 24 states and two Canadian provinces.

ASME Petroleum Division Presents National Awards

Dr. E. N. Kemler, retiring chairman of the Petroleum Division of ASME, was presented a national award by the ASME council for his outstanding contributions to the advancement of the engineering profession.

Dr. Kemler has been a member of ASME since 1927. He has served the engineering profession as an operating engineer, research scientist, and professor engineering. Kemler also has served ASME as chairman of two local sections, chairman of the Petroleum Division Production Committee, chairman of the Petroleum Division Research Committee and as secretary and chairman of the Petroleum Division.

O. L. Lewis, incoming chairman of the division, awarded the following certificates of appreciation to retiring committee chairmen: L. Ballard, Tide Water Associated Oil Company, for services as chairman of the applications committee; J. S. Rearick, M. W. Kellogg Company, for services as chairman of the Refining Committee; C. C. Keane, Great Lakes Pipe Line Company, as chairman of the Transportation Committee; T. L. White, Commercial Shearing and Stamping Company, services as chairman of the Manufacturers Committee; A. Foster, Petroleum Engineer Publishing Company, chairman of the Press Committee; and H. E. Degler, Marley Company, services as publicity secretary.

Mack comes in costs go down

It happens all the time. A truck user finds that heavy loads, rigorous weather, or tough terrain are proving too much for the trucks he owns. Frequent breakdowns . . . interrupted output . . . excessive repairs—all conspire to boost his costs and cut his profit margin. Then—if he's smart—he switches to Mack six-wheelers.

And that's where he gets a real eye-opener. Because even under the most adverse hauling conditions—hub-deep mud, slippery sand or pitted rock-strewn ground—his Mack six-wheelers keep the big loads moving on dependable, time-saving, cost-cutting schedule.

The reason why? It's found in Mack's Balanced Bogie with exclusive Power Divider that assures positive traction no matter how tough the going. Acting normally as a true differential the Mack Power Divider delivers torque between the two bogie axles in proportion to wheel traction, thus eliminating useless wheel slippage and spinning.

Mack's Balanced Bogie and Power Divider combine with numerous other outstanding Mack features to give you the power, strength, traction and easy maintenance you need to handle the biggest loads—with greater profit to you. Your nearest Mack branch or distributor will gladly give you all the facts.

Mack TRUCKS

. . . outlast them all

Mack Trucks, Empire State Building, New York 1, N. Y. Factory branches and distributors in all principal cities for service and parts. In Canada: Mack Trucks of Canada, Ltd.

Throughout the oilfields, Mack 6-wheel trucks get the call for tough hauling jobs. Owned by Heard & Heard, Inc., Refugio, Texas, Mack Model LMSW-X is shown taking aboard a mud pump.

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blowout preventer!

The No. 212 is designed for maximum safety and convenience in operation. Manufactured of high-pressure electric steel with 3000 lb. capacity, yet comparatively light in weight. It can also be used for swabbing or running rods in wells that head, or flow, in course of operations. The Ratigan No. 212 Blowout Preventer is equipped with the latest type retractable rubbers . . . simply unscrew the plugs at each end to change. The "212" is manufactured in 2", 2½" and 3" sizes. The 2" and 2½" sizes are supplied both plain and upset and can be furnished in male or female or double female. The 3" size is supplied in male and female only. Sold through leading supply stores everywhere.

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PRESENTING an achievement citation to Walter F. Rogers, right, is J. M. Bugbee, program chairman of the API Southwestern District Study Committee on Drilling Fluids.

Walter F. Rogers Named 'Mr. Mud' by API

Walter F. Rogers, chief chemist at Gulf Oil Corporation's Houston, Texas, Production Laboratory, has been designated "Mr. Mud" resulting from an achievement citation presented him by the American Petroleum Institute's Southwestern District Study Committee on Drilling Fluids.

The award, given on behalf of the committee by J. M. Bugbee, program chairman, was signed by all members of the committee.

Rogers, whose new book, "Composition and Properties of Oil Well Drilling Fluids" (second edition), is coming off the presses and is being sold by The Gulf Publishing Company, Houston, received his bachelor of science in chemical engineering from the University of Pittsburgh in 1926 and his chemical engineering degree in 1934. He began work with Gulf Refining Company at Port Arthur, Texas, in 1926, and transferred to Mellon Institute Fellowship in Corrosion for Gulf Production Company, Houston, in 1927.

Rogers' technical activities have been primarily in corrosion of pipe line and production equipment and oil well drilling fluids. In September, 1942, his first paper on muds was presented before the fall meeting of the American Institute of Mining and Metallurgical Engineers. He has published numerous papers on corrosion of oil production and pipe line equipment.

He is president of the National Association of Corrosion Engineers, and is a member of the API, American Chemical Society, and National Association of Corrosion Engineers.

Mid-Continent Oil and Gas Announces New Officers

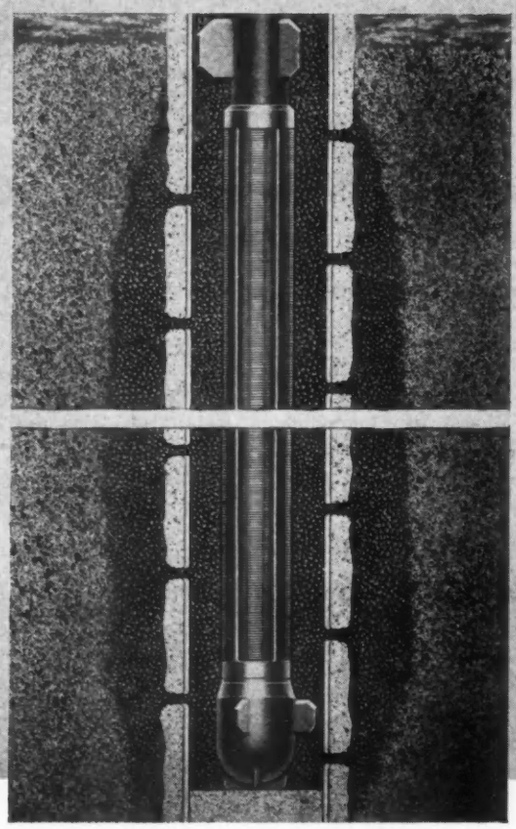
Robert F. Windfohr, independent oil producer of Fort Worth, is the new president of the Mid-Continent Oil and Gas Association, succeeding William T. Payne of Oklahoma City, president of Big Chief Drilling Company. Guy F. Woodward, counsel, Noble Drilling Co. and Samedan Oil Corporation, Tulsa, was elected first vice president, succeeding Robert B. Anderson, W. T. Waggoner Estate, Vernon, Texas, who is new Secretary of the Navy.

Other officers named were Thomas H. Marshall, retired vice president, Anderson-Prichard Oil Corporation, Oklahoma City, vice president for Oklahoma; Jack A. Vickers, president, Vickers Petroleum Company, Wichita, vice president for Kansas; Harry W. Bass, president of H. W. Bass and Sons Co., Dallas, vice president for Texas; A. H. Weyland, president, Arkansas-Louisiana Gas Company, Shreveport, La., vice president for Louisiana; C. H. Murphy, Jr., president, Murphy Oil Company, El Dorado, Ark., vice president for Arkansas; G. Goldon Green, oil producer, Jackson, Miss., vice president for Mississippi; James L. Duffy oil producer, Grove Hill, Ala., vice president for Alabama; Vincent J. Nolan, oil producer, Mt. Vernon, Ill., vice president for Illinois-Indiana-Western Kentucky; Clarel B. Mapes, Tulsa, general secretary-treasurer.

Alexander Is President Of Petroleum Geologists

Roger G. Alexander Jr., Salt Lake City, is the new president of the Inter-mountain Association of Petroleum Geologists. Other officers named are Warren M. Woodward, Shell Oil Company, vice president; Henry H. Heikkila, Phillips Petroleum Company, secretary; and John W. Cooke, Jr., Continental Oil Company, treasurer, all of Salt Lake City.

Eliminates Sand Trouble- Lengthens Well Life



THE LAYNE GRAVEL PACK

More and more operators are having Layne & Bowler Gravel Pack their wells . . . thus eliminating sand trouble and lengthening the life of the well.

If you are confronted with the expense of frequently pulling tubing to replace sanded up screen and sand cut parts and other expense involved in reworking wells, consult Layne & Bowler engineers on the Layne Gravel Pack . . . the modern way of controlling productive sands.

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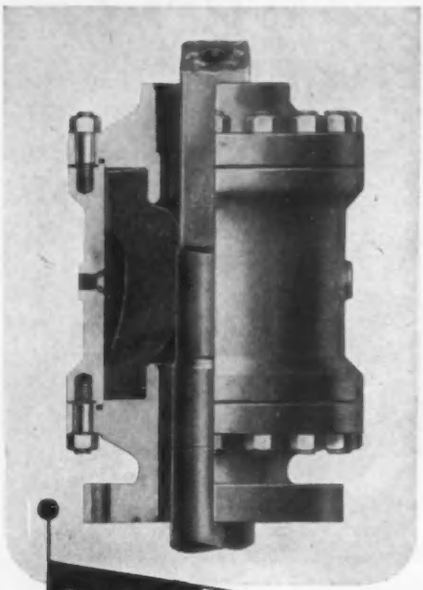

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BLOWOUT PREVENTER

Gives you complete blowout control at all times. Instantaneous closure can be made by remote control by applying pressure behind rubber packer. Inner and outer slot arrangement in moulded rubber packer prevents closure distortion. Normally open to full size of casing—will close around any size or shape of pipe, kelly or tool. No parts to change—no metal-to-metal parts to become inoperable. Thoroughly proven in actual use in all major domestic and foreign oil fields. *Send for detailed information.*

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Quality - Wrought on the Forge of Experience

New Officers of Oil Men's Club Installed

Wayne S. Young, Young Oil Company, past president of the Oil Men's Club of the Ozark Empire, Springfield, Mo., left seated, gives the presiding officer's gavel to A. S. Grier, Standard Oil Company (Indiana), the incoming president. Seated next to Young is Mayor W. L. English, Springfield, and at right is W. A. Whitlock, M. F. A. Oil Company, vice president. Standing left to right are Burl Hamilton, Continental Oil Company, new director; Ralph Madden, Madden Oil Company, treasurer; D. J. Griffin, Tide Water Associated Oil Company, outgoing treasurer; W. E. Ed Day, Skelly Oil Company, outgoing secretary; Joe Cummingham, Cummingham Equipment, director; and Charley Baum, Baum Oil Company, outgoing vice president. E. K. Stoudard, incoming second vice president, is not shown.

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and obviously into your newer, high speed machines, too!

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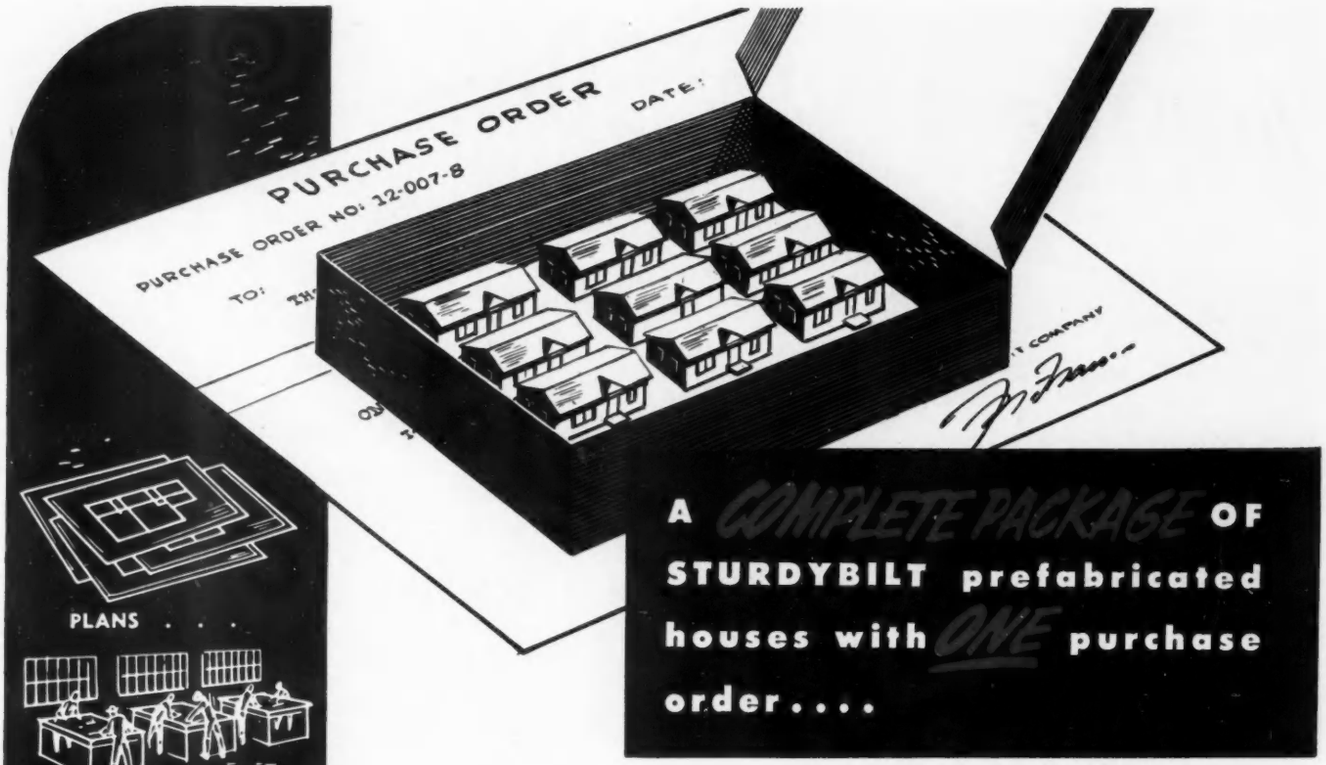

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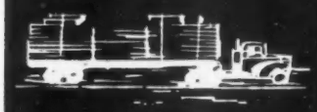

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When you buy STURDYBILT Housing you have no worry about plans, construction, design or erection. One purchase order from you sets in motion the prefabricating, transportation and erection of practically any type of buildings you need. All you do is tell us what buildings you need and where they are to be located. We are your architect, contractor and builder. This is the fast, efficient and economical way to get the modern housing you need.

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In 49 Cases Out of 50...

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WICHTEX SERVICING UNIT

Buys *ONLY* Wichtex thereafter

There are many reasons for this amazing record. Summing them all up, it is simply the fact that Wichtex units mean outstanding service and efficiency at minimum investment, and with the lowest upkeep cost in the field.

You should investigate Wichtex units before you buy. Compare them performance-wise and cost-wise. You'll find they're your best buy.

Pictured above, working over a derrick, is a Wichtex Model C-65, owned by Wilcox Well Service, Rule, Texas.

Wichtex manufactures a complete line of well servicing units, varying in rated capacity from 2000 feet to 12,000 feet. We invite you to write for further information.

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WICHITA FALLS, TEXAS

Safety Engineers Name Claiborne Vice President

Fred Claiborne, assistant to safety supervisor, Standolind Oil and Gas Company, Tulsa has been elected vice president of the Southwestern Region of the American Society of Safety Engineers. The Southwestern Region of the ASSE includes 11 chapters in Oklahoma, Texas, northern Louisiana, and southern Kansas.

Fred Claiborne

A native Texan who was educated in Oklahoma, Claiborne joined Stanolind in 1936 after several years in the teaching field. He became assistant personnel and safety supervisor for Stanolind's Central division in 1938. In 1944, he was placed in charge of safety for the Exploration department of the company. When responsibility for safety was placed in the operating divisions in 1948, he became assistant to the safety supervisor, his present position. Claiborne's experience in the field of safety also includes two years as chief safety engineer for the National Gypsum Company's McGregor, Texas plant.

Rocky Mountain Geologists To Meet February 22

More than 1600 geologists of the nation will gather at Albuquerque, N. M., for the fourth annual meeting of the Rocky Mountain Section, American Association of Petroleum Geologists February 22. The theme, "Exploration Frontiers of the Rocky Mountain Region," will be developed through addresses by prominent geologists of the Rocky Mountains during the three-day meetings.

Max L. Krueger, geologic consultant of Laramie, Wyo., will speak on geologic aspects of the region with Robert O. Anderson, president of Malco Refineries, Inc., Roswell, N. M., discussing economics of the industry in the region.

Paul H. Umbach, Denver oil consultant and president of the group, will review history of the section. Each geologic province of the region, extending from northern New Mexico into the Canadian Rockies, will be reviewed and discussed at this meeting.

Special entertainment and activities are planned for wives of those attending, and on Exhibits Day the most up-to-date equipment for the oil industry will be on display for the geologists.

New York Desk and Derrick Officers Are Announced

Elizabeth Van Kuyk of the Socony-Vacuum Oil Company was elected 1954 president of the Desk and Derrick Club of New York City recently. Miss Van Kuyk is assistant manager of the pipe line right-of-way division at Socony.

Other new officers are Constance Keller, Esso Standard Oil Company, vice president; Ruth Leonard, The Texas Company, recording secretary; Dorothy Watson, Ethyl Corporation, corresponding secretary; Muriel Havens, Tide Water Associated Oil Company, assistant corresponding secretary; Mary Conroy, Chase National

Let's talk SENSE about PLASTIC PIPE

• Let's face it! Plastic pipe is revolutionizing oil country piping. Of course plastic cannot be used on every installation . . . but even metallic piping is impractical for certain applications.

• CARLON Plastic Pipe is specifically developed for oil country piping and has been rigidly tested. Carlon engineers have determined exactly how CARLON Plastic Pipe will perform on specific installations.

• CARLON is definitely superior to metal pipe when used for lead, distribution, salt water disposal and gathering lines, as well as risers, gas vents and fresh water transmission.

• CARLON resists the effects of acids, crude oil, sour crude and sulphurous waters. The smooth interior walls in most instances prevent accumulation of paraffin, scale and sediment and remain clean throughout the installation period.

• CARLON is not a universal oil piping material . . . it has limitations. But if utilized within the established limits of pressure and temperature, CARLON Plastic Pipe provides years of trouble-free service. Use it right and you can't go wrong . . . that's why CARLON is unconditionally guaranteed to meet the highest standards of quality and performance.

Send today for complete information on CARLON Plastic Pipe for oil country piping.

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USE KINZBACH WHIPSTOCKS AND MILLS TO SIDETRACK YOUR HEADACHES

Type "A" Mill

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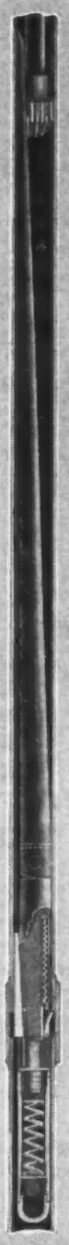
Kinzbach Whipstocks can be set at any depth and require no support for the bottom. Positive setting slips prevent slipping or turning in the hole. The Kinzbach hinge arrangement assures that the top of the Whipstock will be close against pipe wall at all times, permitting easy passage of drilling tools. Setting trigger always locates the Whipstock between couplings so that the window will be within one joint. Kinzbach Whipstocks are available in all popular casing sizes through your supply store.

Use Kinzbach Milling Tools for every whipstocking or metal cutting operation. They have high-speed tool steel inserts which are ground and set at the most efficient angle for fast, uniform cutting action. Shown at left are four popular models—see your Kinzbach Catalog for a description of the complete series of Milling Tools.



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Bank, treasurer, and Ann Highnett, E. I. DuPont de Nemours & Company, assistant treasurer.

Elected to serve on the board of directors for two years were Eunice Wilder, Esso; Rosemary Goodrich, Shell Oil Company; and Clara Snow, Standard Oil Company (New Jersey). Remaining on the board are Ruth Kellner, Continental Supply Company; Gertrude King, Gulf Oil Corporation; and Margaret Sweeney, Sinclair Refining Company. Edna Hurry, Standard Oil Company (New Jersey), outgoing president, will serve on the board.

Sleeman Named Manager Of LPGA Canadian Office

Arnold J. Sleeman has been retained as secretary-manager of the East Canadian District, Liquefied Petroleum Gas Association, Chicago. His office is at 19 Richmond St., W., Toronto, Ont.

Sleeman is identified with Edward B. Higgins & Associates, Canadian firm specializing in trade association operations. A graduate of the University of Toronto, he was employed in the public relations department of the British-American Oil Company, Toronto, before joining the Higgins organization.

The Toronto office will provide local services to Canadian industry members and operate on a basis similar to other LPGA district headquarters, located in Wichita, Kansas; Denver, Colo.; Altanta, Ga.; Boston, Mass.; Chicago, Ill., and Harrisburg, Penn.

Educational Lectures Planned for NACE Meeting

The National Association of Corrosion Engineers has included in the technical program for its March 1954 meeting three educational lectures. The lectures, to be given from 4:30 to 5:30 pm, on March 16, 17 and 18, 1954, at the Kansas City 10th Annual NACE Conference and Exhibition, are as follows:

"Fundamentals of Street Corrosion," by J. J. Harwood, Office of Naval Research, Navy Deptartment, Washington, D. C.

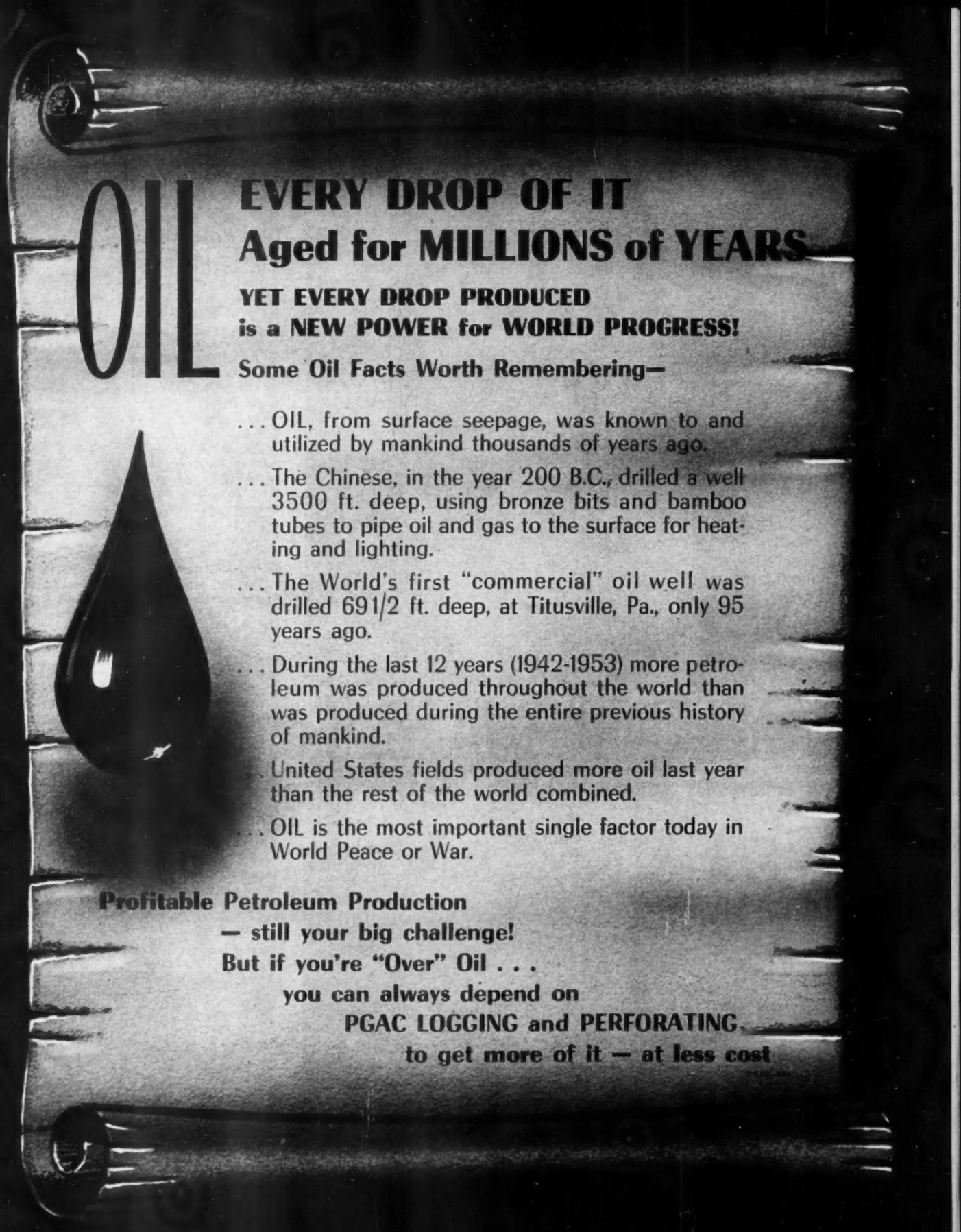
"Fundamentals of Cathodic Protection," by R. C. Weast, Case Institute of Technology, Cleveland.

"Design and Interpretation of Field and Service Corrosion Tests," by F. L. LaQue, The International Nickel Co., Inc., New York.

ASME Metropolitan Group Names New Officers

Harry Knecht, assistant mechanical plant engineer at the Consolidated Edison Company, has been elected chairman of the executive committee of the Metropolitan Section of The American Society of Mechanical Engineers. Other officers elected are Allen T. Kniffen, project engineer at the Air Reduction Company, secretary; Henry J. Scagnelli, engineer at the Ward Leonard Electric Company, treasurer; and Miss Muriel O. England, who was re-elected assistant secretary-treasurer.

V. Weaver Smith, vice president of The Lummus Company, was made a Fellow in the society. The award, for outstanding contributions in the mechanical engineering field, was presented by Henry R. Kessler, vice president of the society and manager of Republic Flow Meters Company.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EVERY DROP OF IT
Aged for MILLIONS of YEARS
YET EVERY DROP PRODUCED
is a NEW POWER for WORLD PROGRESS!
Some Oil Facts Worth Remembering—
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. . . The Chinese, in the year 200 B.C., drilled a well 3500 ft. deep, using bronze bits and bamboo tubes to pipe oil and gas to the surface for heating and lighting.
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. . . During the last 12 years (1942-1953) more petroleum was produced throughout the world than was produced during the entire previous history of mankind.
. . . United States fields produced more oil last year than the rest of the world combined.
. . . OIL is the most important single factor today in World Peace or War.
Profitable Petroleum Production
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EXAS: Houston, LYnchburg 4161 — Corpus Christi, 3-1324 — Dallas, RAndolph 2943 — Longview, Plaza 9-4486 — Alice, 4-5872 or 4-3092 — Mission, 5-1687
Abilene, 2-4172 — Gainesville, 2517 — Odessa, 6-6429 — Beaumont, 2-4263 — Victoria, 1023 — Graham, 1728.

OUISIANA: Shreveport, 3-1648—Lake Charles, 4724—Lafayette, 4-2396. KANSAS: Great Bend, 4306 or 4307. NEW MEXICO: Hobbs, 3-5852

KLAHOMA: Oklahoma City, CEntral 2-5342—Pauls Valley, 1577—Seminole, 2938—Healdton, 77—Ardmore, 857.

AFFILIATE COMPANIES: CANADA—Perforating Guns of Canada, Ltd.; Edmonton, Alberta
GERMANY—Atlas Deutsch-Amerikanische Olfelddienst G. m. b. H.; Kiel

What's Happening

AMONG SERVICE AND SUPPLY MEN

Flagship Makes Maiden Cruise

Halliburton Oil Well Cementing Company's marine operations section has acquired a flagship and added to its fleet of cementing craft and barges the "Halliburton 206," first ocean-going cementing ship. Quarters for eight are located forward, cementing and bulk cementing amidships, ship's engine room, galley, pilothouse and quarters for four are located aft.

Guiberson Completes New Laboratory

The new 12,000 square foot engineering building and hydraulic testing laboratory of The Guiberson Corporation in Dallas has been completed. The new laboratory provides field condition testing of Guiberson oil field equipment and is equipped with three cased test holes incorporating high pressure and high temperature testing equipment. The laboratory utilizes the full height of the two story building plus an eight-foot well cellar, which allows the engineers to run swabs and set packers and anchors as though they were at the well location.

Lane-Wells Fellowship Awarded to Canadian

John E. Wilcox, of Dawson Creek, British Columbia, is taking advanced studies in petroleum engineering at the University of California in Berkeley, Calif. on a fellowship awarded by the Lane-Wells Company.

John E. Wilcox

The Lane-Wells fellowships were established in 1952, as part of the company's scholastic program, for the purpose of aiding graduate engineers to carry on the research and study necessary for a masters or doctor's degree.

Wilcox, who plans to specialize in secondary recovery and oil property evaluation, attended the Peace River South Grammar and High Schools in Dawson Creek and took his collegiate work at the University of British Columbia, in Vancouver, and at the University of Alberta, in Edmonton. He is a member of the American Institute of Mining and Metallurgical Engineers and belongs to the Association of Professional Engineers of Alberta.

Holt Named Field Engineer For Security Engineering

Cleve Holt, Jr. has been appointed Oklahoma district field engineer for Securiety Engineering. Holt will spend the majority of his time contacting drillers and tool pushers, to assist them with drilling problems.

Holt holds a B.S. degree from Oklahoma University; he later continued his studies at the University of West Virginia.

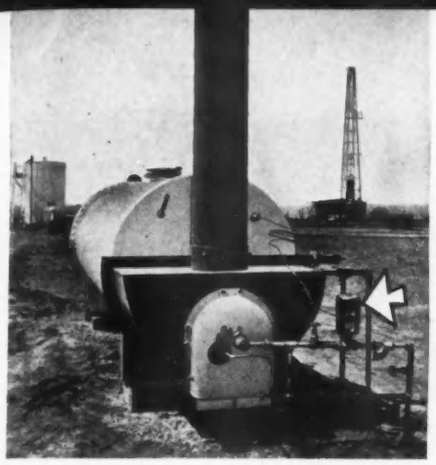
Bovaird Supply Reelects Officers and Directors

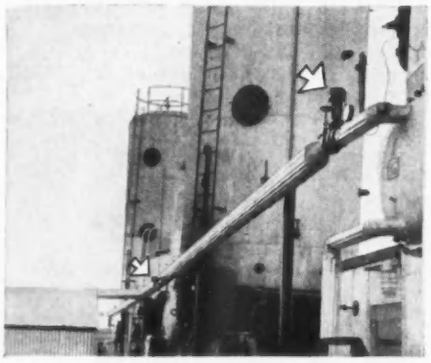
Officers and directors of the Bovaird Supply Company were re-elected at the annual stockholders and directors meetings held in Tulsa. Officers re-elected were D. D. Bovaird, president; Frank D. Bovaird, executive vice president; Roscoe G. Ayers, vice president and general manager of sales; R. E. Batchelor, general manager of stores; William J. Bovaird, assistant general manager of stores; R. M. McMahan, secretary; M. B. Park, assistant secretary; and T. H. Trower, treasurer.

Directors include D. D. Bovaird, Frank D. Bovaird, R. G. Ayers, R. E. Batchelor and R. M. McMahan, all of Tulsa, and A. E. Booth of Bradford, Penn.

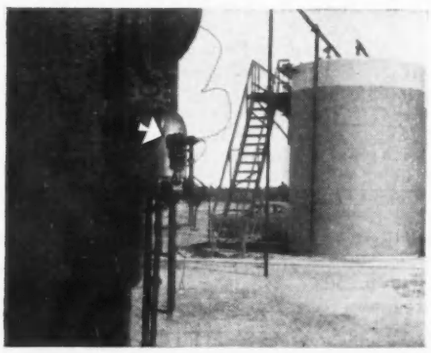
The company has recently opened a store at Lovington, New Mexico, and is expanding its offices and facilities at Tulsa.

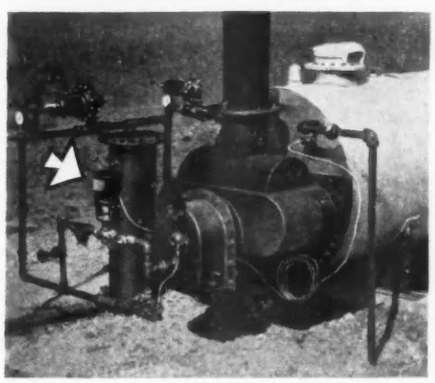
Get Peak Efficiency
from Oil Field Production Equipment





USED BY LEADERS IN THE INDUSTRY





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No. 11-OFT Self-Operating Temperature Regulator

✓ Check these features that give Economical Trouble-free Performance — in all kinds of weather

1) Thermal system has OVER-heat protection. Powerful two-ply bellows and single seat composition disc valve assures tight shut off.

2) Valve stem lubricator helps give closer control, reduces packing gland troubles.

3) Rugged, built for long reliable service in all kinds of weather. Operate efficiently down to 60° F. below zero.

4) Durable Valves are direct acting, have single seat bronze body with double unions, for easy installation, composition disc and stainless steel seat.

5) Temperature adjustment range: 110 to 190° F., other ranges between 30 to 370° F.

6) Bulb Well is cadmium plated steel and extra heavy plain capillary tubing is 10 ft. long.

Powers No. 11 Regulators are backed by over 60 years experience making *SELF-OPERATING* controls. They are used by leading manufacturers of heaters and treaters.

Simplify Your Control Problems—Standardize on Powers

[b47]

THE POWERS REGULATOR COMPANY

SKOKIE, ILLINOIS • Offices in Over 50 Cities in U. S. A., CANADA and MEXICO

See Your Telephone Directory

OVER 60 YEARS OF AUTOMATIC TEMPERATURE CONTROL

Magna Products Announces Transfers and Promotions

W. E. Messick, president of Magna Products, Inc., Santa Fe Springs, Calif., oilfield scale and corrosion engineering service company, has announced the following transfers and promotions.

D. M. McCloud, formerly field service engineer, has been appointed general manager of Magna Products, Inc. in California; Paul Wendt, formerly chief clerk, named office manager of the Santa Fe Springs home office; E. N. Frisius, vice president of the company, appointed general manager of the recently organized Magna of Texas, affiliate of Magna Products, Inc., with headquarters in Kilgore, Texas; Al Mortimer, field service engineer in the California headquarters, has been transferred to Kilgore, Texas, as sales and service manager of the Texas organization; and Dr. G. H. Rohrback of Crest Research Laboratories, Seattle, Wash., has been retained as a consulting chemist by Magna Products, Inc. to aid in the development of new materials and processes.

Philco Transfers Departments From New York to Philadelphia

Philco International Corporation has announced the transfer of its sales and advertising departments to Philadelphia from New York. Sydney L. Capell, president of Philco International, said the transfer brings together the domestic and international sales activities of Philco at the corporation's Philadelphia headquarters.

Hans Nielsen

Hermann Janssen

Perforating Guns Atlas Extends Operations to Germany

Perforating Guns Atlas Corporation announces extension of the company's logging, perforating and core sampling operations to Germany's oilfields. The firm has organized an affiliate company, the Atlas Deutsch-Amerikanische Olfelddienst G.m.b.H., for operations in Germany and headquarters and laboratories have been established at Rankestrasse 1, in the city of Kiel.

Erich W. Dressler

Dr. Hans Nielsen, who has been appointed general manager of the affiliate company, received his mechanical and electrical engineering degrees from the University of Dresden in 1928, after which he served as scientific assistant at the university for five years. Nielsen joined the Edeleanu Company at Berlin in 1934 as research engineer. From 1936 to 1942, he was chief engineer of the diesel motor division of the Deutsche Werke Kiel A.G. In 1949 Dr. Nielsen was appointed general manager of the Gesellschaft fur nautische und tiefbohrtechnische Instrumente m.b.H., at Kiel.

Another member of the affiliate staff at Kiel is Erich W. Dressler, a graduate of the Breslau Technische University and a design engineer with Hagenuk-Kiel from 1927 to 1931. He was chief design engineer and operator at the Kiel plant of Gelsellschaft Instrumente m.b.H. for five years and later headed a bureau of instrument design of the German Navy. He rejoined Gelsellschaft Instrumente as design and operating engineer in 1949. Perforating Guns Atlas brought Dressler to Houston last year to acquaint him with the company's United States and Canadian operations.

Dr. Hermann Janssen, also a member of the staff at Kiel, received his degree in mathematics and physics in 1933 from the University of Kiel. The following three years he spent as research assistant at the Institute of Physical Research and then was employed for three years as physicist by Gesellschaft Instrumente m.b.H.

The new German firm is the second affiliate company established by Perforating Guns Atlas Corporation. Their Canadian oilfield operations have been handled for some years through an affiliate company, Perforating Guns of Canada, Ltd., which has offices at Edmonton, Calgary, and Stettler in Alberta Province; and other offices at Swift Current and Kindersley in Saskatchewan Province. Perforating Gun Atlas' main offices and plants are at Houston, from where all operations of its 31 offices are now directed.

"Weigh the evidence"—
you'll buy McKISSICK!
McKISSICK
TRAVELLING
BLOCKS
Are Proven Performers
Center plates support pins between each sheave, distributes weight more evenly, prevents center pin deflection.
Illustrated is combination with Byron-Jackson hook, of heavy steel construction throughout. No need to add ballast for extra weight.
Catalog on Request
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McKISSICK PRODUCTS CORPORATION
Box 2496 Tulsa, Oklahoma

Dr. W. Wray Love

Leo J. Kutlich

Dowell Incorporated Names Love Director of Research

Dowell Incorporated has promoted Dr. W. Wray Love, Salem, Ill., to director of research in the company's general offices in Tulsa.

Love will direct and coordinate the functions of Dowell's technical research department, chemical laboratory, field development program and design engineering. At the time of his promotion, he was district manager of Dowell's Salem, Ill., district which offers services in Minnesota, Wisconsin, Illinois, Iowa, Indiana, Missouri, Kentucky, Tennessee, Arkansas, Alabama, Georgia, South Carolina and Florida.

Leo J. Kutlich was named by Polk to succeed Love. Kutlich has been Salem district operations engineer.

Love worked for the Gypsy, Ohio and Phillips oil firms in the early 1920's as a roustabout, tool dresser and pumper in Kansas, Oklahoma and Wyoming. He worked in Venezuela for two years in geological exploration. Love joined Dowell in 1934, about the time he received his doctor's degree in petroleum geology from the University of Illinois. For five years he ranged from Oklahoma to Canada as a Dowell engineer. He was promoted to Salem district engineer in 1940 and a district manager in 1944.

Kutlich joined Dowell in 1942 as a truck driver at Flora, Ill. In 1945, he was appointed a Service Engineer at Flora. Subsequent promotions were: Station Manager, 1947; Area Development Engineer, 1950; District Development Engineer and District Operations Engineer, 1952.

Kirberger Receives Post With Service Drilling Company

R. Earl Kirberger of Tulsa has been named to the position of assistant to management of Service Drilling Co. and affiliated companies.

R. Earl Kirberger

Kirberger has had experience with several national and local equipment manufacturers and organizations in sales and service work; in the drilling, producing and service phases of the oil business, both domestic and abroad.

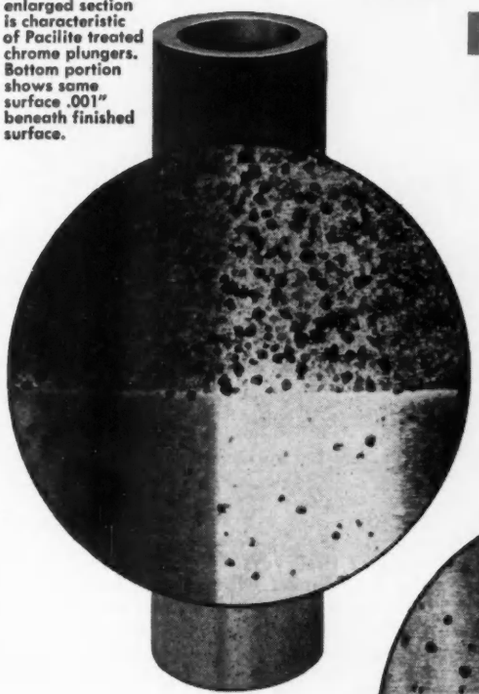
Templeton, Kenly & Co. Move Into New Plant

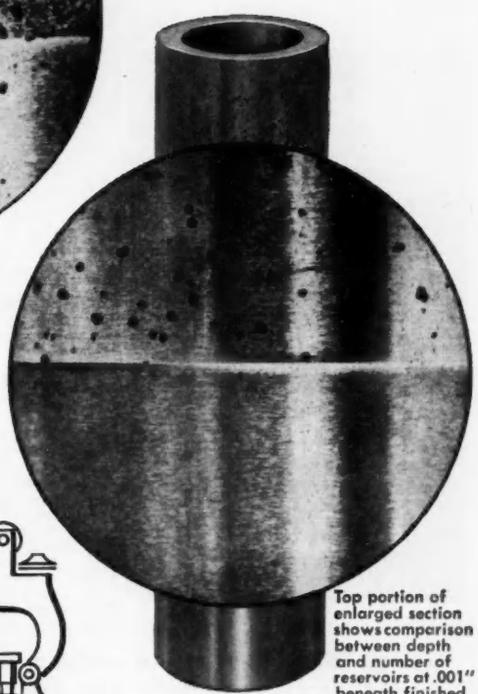
Templeton, Kenly & Co., manufacturer of Simplex Jacks, has moved into its new plant in Broadview, Ill., a suburb of Chicago. The move to larger quarters was dictated by the development of new prod-

The New Pacific

PACILITE (TRADE MARK) PLUNGERS FOR DEEP OIL WELL PUMPING...

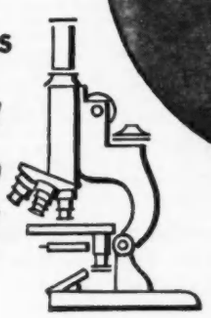
The number of surface reservoirs on top portion of enlarged section is characteristic of Pacilite treated chrome plungers. Bottom portion shows same surface .001" beneath finished surface.





Top portion of enlarged section shows comparison between depth and number of reservoirs at .001" beneath finished surface and .005" where controlled etching has eliminated reservoirs.

HAVE MILLIONS OF MICROSCOPIC PORES that actually soak up lubricants!



Pacific Pacilite process is a method of control etching a multitude of minute surface reservoirs to provide maximum retention of lubricants after the chrome plated plunger is ground to desired size. Result is much longer plunger life and virtual elimination of sticking and galling. Pacilite treatment also relieves high tensil plating stress and reduces possibility of cracking or shearing under heavy shock loads. For complete details write for Technical Bulletin No. 201.

PACIFIC Precision Built PUMPS

Pacific Pumps inc.

ONE OF THE DRESSER INDUSTRIES

HUNTINGTON PARK, CALIFORNIA

DW-10 Export Office: Chanin Bldg., 122 E. 42nd St., New York

Offices in All Principal Cities

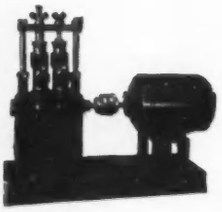
MULTI-FEED CHEMICAL FEEDERS

Manzel flexibility permits *accurate* feeding of *many* different chemicals simultaneously. Chemicals can be pumped *into* other liquids or test samples drawn from production at regular intervals. The illustration shows a Manzel with 7 feeds, each of which can be individually set to draw an exact amount of chemical from its own tank.

Whatever YOUR Need in Chemical Feeders

LARGE OR SMALL CAPACITIES

Manzels Chemical Feeders pump from a fraction of a drop to 60 gph per feed . . . with *unsurpassed accuracy and dependability*. You eliminate troubles due to guesswork, inaccuracy, or forgetfulness. Any number of feeds, any type of drive. Easily synchronized with any process



● When you have a problem of feeding one liquid into another . . . no matter how light, or heavy, or corrosive . . . you can rely on Manzel's long experience in *precision* proportional pumping.

Manzel Chemical Feeders can be individually engineered for most applications . . . and they are priced much lower than you might expect. Write for details today.

Ask Manzel

A Division of Frontier Industries, Inc.
281 Babcock Street
Buffalo 10, N. Y.

SPECIALIZING IN HIGH PRESSURE METERING PUMPS SINCE 1898

ucts, particularly hydraulic jacks and pullers.

The single story plant, located on a five acre tract at Gardner Road and 16th St., Broadview, contains 96,000 square feet of space. The one-floor layout of the plant permits smooth flowing production of all types of Simplex lever, screw and hydraulic jacks. The manufacturing section has a centrally-located mezzanine parts storage area accessible to both machining and assembly divisions. Shipping and receiving facilities include a four-truck dock and two-car rail siding. The plant has a steel roof, a wood block floor and fluorescent lighting throughout.

Clifford P. Blackburn

James M. Bugbee, Jr.

Baroid Sales Division Announces Appointments

Baroid Sales Division has announced the appointment of three employes in sales and advetrising.

James M. Bugbee, Jr. is the new district sales representative in Oklahoma City to replace R. R. Morris, who is transferred to Canada. Bugbee has been with Baroid more than seven years, most of the time in the field as a mud engineer.

R. E. Souther

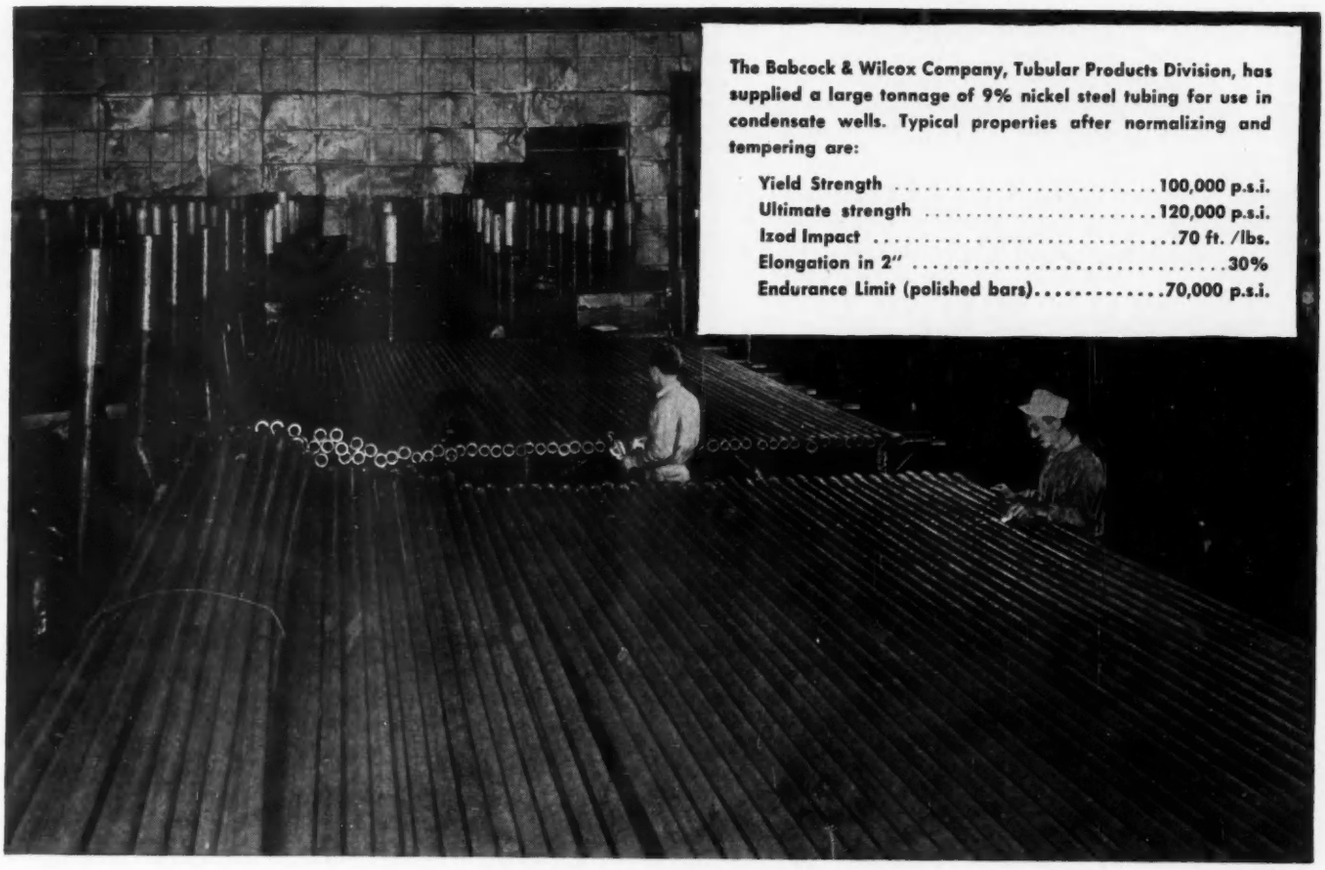
R. E. Souther, Baroid employe for 14 years, was recently appointed manager of the new equipment department. This new department is a consolidation of the Transportation department, Testing Equipment department and the Well Logging Shop. Souther was chief engineer in the Well Logging department before consolidation.

Clifford P. Blackburn, former news reporter and photographer, has been named advertising assistant for Baroid. Blackburn will assist in editing and designing all Baroid Sales Division advertising and sales promotion items.

Control Equipment Named Distributors for Enardo

Phil Drane, president of Enardo Manufacturing Company, of Tulsa, has announced the appointment of Control Equipment, Inc., of Odessa, Texas, as exclusixe distributors for Enardo in the West Texas counties and the eastern section of New Mexico.

Control Equipment, a division of Sivalls Tank, Inc., will service the area with an entire line of Enardo oil field specialty products. They will maintain a large stock of Enardo Vapor Control hatches and valves at Odessa, Abilene, Texas, and Hobbs, N. M.



The Babcock & Wilcox Company, Tubular Products Division, has supplied a large tonnage of 9% nickel steel tubing for use in condensate wells. Typical properties after normalizing and tempering are:

Yield Strength	100,000 p.s.i.
Ultimate strength	120,000 p.s.i.
Izod Impact	70 ft. /lbs.
Elongation in 2"	30%
Endurance Limit (polished bars)	70,000 p.s.i.

Corrosion-Resistance and High Mechanical Properties

Characterize B&W Nicloy-9 Oil Well Tubing

Economy calls for oil well tubing which suffers *least* from corrosive conditions.

Exhaustive tests prove that Nicloy-9, a product of The Babcock & Wilcox Company, Tubular Products Division, Beaver Falls, Pa., is highly resistant to attacks by the fluid from condensate wells. Moreover, the high strength of this material has made it a logical replacement for N-80 tubing.

Actually, Nicloy-9 first attracted attention by its excellent impact values at sub-zero temperatures down to –320° F.

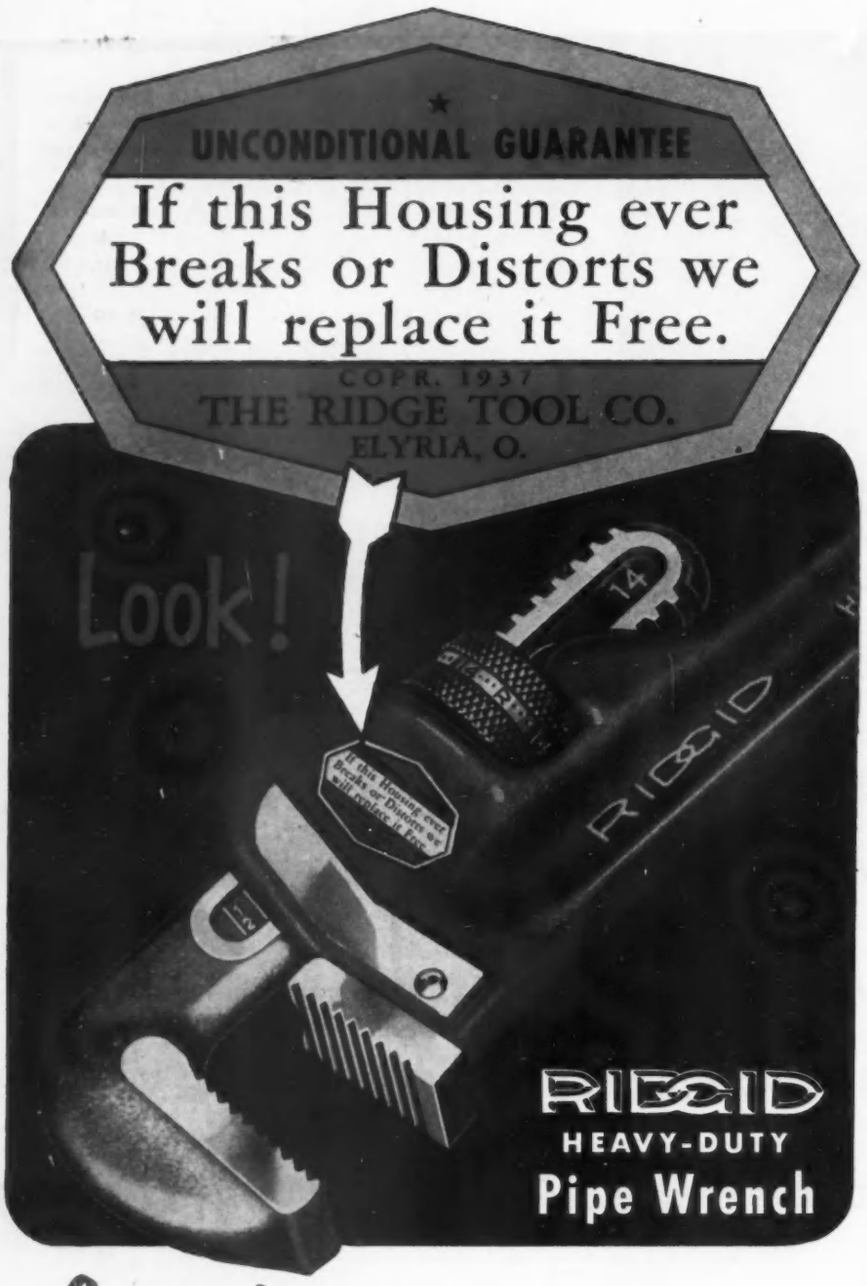
As a result of its superior mechanical properties, together with its excellent resistance to corrosion, this low carbon 9% nickel steel is also being used ... more and more ... as a sucker rod material for corrosive wells. Its corrosion-resisting properties also aid materially in preventing accelerated fatigue failures.

Technical data on B&W Nicloy-9, as well as similar information on Nicloy-5 and -3½, is given in B&W Technical Bulletin 18, copies of which are available on request to The B&W Company, Tubular Products Division, Beaver Falls, Pa.

When you need a metal with extra qualities to assure dependable performance, less maintenance and fewer replacements, think of nickel-alloyed steels. Send us details of your problems for our suggestions.

INCO

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N.Y.



Guarantee that has saved money for millions of users for 30 years

- ★ Housing Guarantee is specific, instant make-good, no argument.
- ★ No-slip no-lock replaceable jaws, handy pipe scale on hookjaw.
- ★ Adjusting nut that spins easily to size, 6″ to 60″.
- ★ Comfort-grip I-beam handle.
- ★ 100% factory pipe testing of every wrench!
- ★ Always the most for your money! Buy RIGID's at your Supply House.

THE RIDGE TOOL COMPANY • ELYRIA, OHIO

RIGID
Work-Saver Pipe Tools

A. R. Wiltsie

O. O. Selke

Reed Roller Bit Employe Retires After 35 Years

Ansel Wiltsie has replaced Oscar Selke as shop superintendent of the Oil Tool Division of Reed Roller Bit Company since Selke's retirement.

Selke, who is among the first half dozen salaried men to retire under the company's retirement plan which has been in effect since 1948, recently completed 35 years service with the company. He started in the firm's original shop on Harrisburg in 1918, as a machinist, one of six in the shop.

Wiltsie, who has been assistant shop superintendent since 1945, has worked in the oil tool industry for 34 years. He first joined Reed in 1919. During World War II he was assistant shop superintendent of the transmission plant operated by Reed under government contract.

Merla Tool Corporation Announces Appointment

Merla Tool Corporation, gas lift equipment manufacturers, announce the appointment of Howard C. Shireman as assistant sales manager. Shireman will be headquartered at the Dallas offices.

Howard Shireman

Shireman has been active in oil field equipment sales for 19 years and was previously division engineer for National Supply Company, district manager for Welex Jet Services and division engineer for Dia-Log Company in charge of the West Texas area.

American Locomotive Company To Build St. Louis Warehouse

American Locomotive Company will build a warehouse and office building in St. Louis, Mo. The one-story structure will serve as Alco's diesel locomotive parts storage depot in the southwestern part of the country and space will be available for the district sales staff.

Alco now serves the railroads through parts warehouses located at Schenectady, N. Y.; Atlanta; Chicago; Los Angeles; St. Louis and Seattle.

The building is expected to be completed late next spring at an estimated cost of $400,000. It will be located at Bingham Avenue and Ray Street on a plot of more than two acres purchased from the Koppers Company, Inc. Contracts for pilings and general construction work will be awarded this week. Engineers and contractors for the project are the Stone and Webster Engineering Corporation, New York.

Oil Well Supply Makes Organizational Changes

Organizational changes in the Gulf Coast area of Oil Well Supply Division of United States Steel Corporation have been announced and a new oil field supply center to serve the Gulf Coast region has begun operation.

A new supply and service unit in Houston, to serve as an area warehouse, will also house the area office personnel. The warehouse will not only serve the industry operations around Houston, but will back up other stores in the Gulf Coast with heavier stocks and provide access to Gulf Coast manufacturers' stocks through a buyer whose office will be at this location. Teletype service from Gulf Coast stores will provide contact with the area warehouse.

Instead of three districts, two districts have been designated. The Southeast Texas-South Louisiana and Mississippi District has headquarters at New Orleans while the Southwest Texas District headquarters will be in San Antonio, Texas.

United States Rubber Names Regional Managers, Engineers

The appointment of three new regional managers and two sales engineers in construction tire sales has been announced by the U. S. tires division of United States Rubber Co.

Ben F. MacCormack, new eastern regional manager, will make his headquarters in New York. Henry Hitchins has been appointed sales engineer for construction tire sales in the east, and will be under the direction of MacCormack.

C. N. Clabough has been named central regional manager, with headquarters in the Chicago branch, and Dugald McKinnon has been appointed western regional manager, with offices in Denver.

Joseph Bernat has been appointed sales engineer to assist McKinnon in the western region.

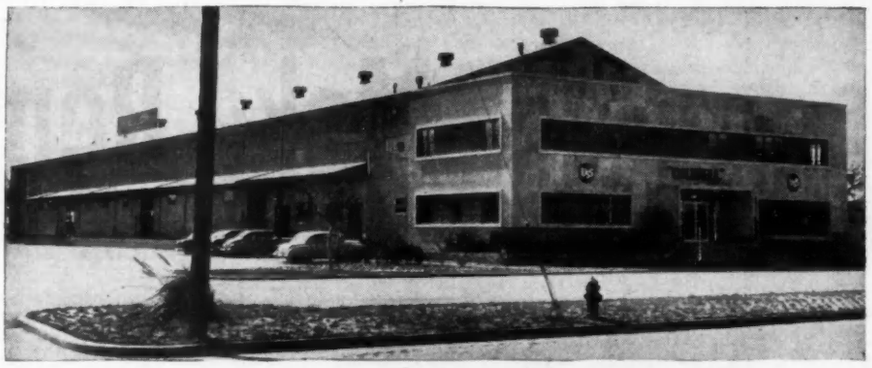
Denison Company Announces Hydraulic Scholarship Fund

A scholarship award plan to "foster interest in the rapidly expanding field of industrial hydraulics" has been announced by W. C. Denison, president and chairman of the board of the Denison Engineering Company, manufacturer of hydraulic presses and components.

The annual award is under the auspices of the William C. Denison, Jr. Foundation, and will be awarded annually to one or more graduates of Franklin County (Columbus, Ohio) high schools with the possibility of a second award being available to a graduating student with a parent in the employ of the Denison company.

Applicants must be under 25 years of age, residents of Franklin County and have maintained a scholastic average in the upper one-third of their graduating class. Selection of winners is in the hands of an awards committee, which this year is composed of Glenn A. Rich, School Supervisor for the Ohio Department of Education; Dr. Clyde E. Williams, Director of Battelle Memorial Institute; and William E. Taylor, Executive Secretary of the Columbus Industrial Association.

Winners have a choice of colleges, but they are to select a course of studies in hydraulics, or in engineering with special emphasis on hydraulics.



Oil Well Supply's New Houston Center

RED DEVIL

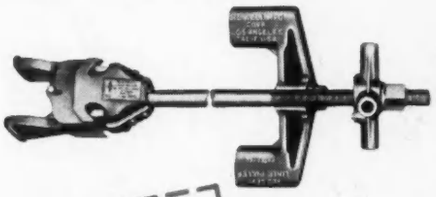
"DIA-HARD" Slush Pump Liners

High Hardness and High Carbon The Combination for Longer Life

Maximum wear resistance results from the combination of *high hardness* and *high carbon*, not from high hardness alone. The deep wear resistant case of Red Devil "Dia-Hard" liners has a uniform *hardness* of 62-64 Rockwell "C" and a uniform *high carbon* content in excess of 1.00%. This combination of a case of high hardness and abrasive resistant carbides with a core of high tensile strength and ductility is obtainable only by our special "Dia-Hard" process.

Integrally forged liner glands; precision honed bore. Outside dimensions are accurately machined assuring perfect working fits with liner packing assembly and pump cylinder for positive sealing against modern high pressure pump operation.

Write for Price Catalog No. P-120.



LINER PULLERS

The Red Devil Liner Puller is a strong, heavy duty tool capable of pulling the most obstinate liner. Simple in operation, there are no pins, connecting links or other small parts to bend, shear, break or lose. Two Types: "Universal Type" (as illustrated) for slush pumps, the "Expanding Grip Type" for pulling thin wall tube-type liners in small pumps. *Write for Price Catalog No. P-122.*

TELL-TALE LINER PACKING ASSEMBLIES

Give warning before pump damage

Tell-Tale Liner Packing Assembly consists of two "Dia-Tex" oil and heat resistant sealing rings separated by a precision machined corrosion-resistant steel lantern ring. Internal leakage is detected instantly through the tell-tale hole before costly fluid cuts can damage the slush pump. For information on Red Devil Tell-Tale Packing Assembly or "Dia-Tex" Liner Sealing Rings *write for Price Catalog No. P-121.*

Consult Composite Catalog

for full information on Red Devil Products or write for price catalogs. Red Devil Products are available through your supply store.

Oil Well Manufacturing Corp.

6008 S. Alameda Street, Los Angeles 1, California

Make Republic your

Celebrate Plant Expansion

J. E. Jonsson, president of Texas Instruments Incorporated, and C. H. Green, president of Geophysical Service Inc., congratulate each other during the recent open house marking the completion of the TI-GSI plant expansion program. Located in Dallas, the plant has 200,000 square feet of plant area devoted to manufacture of precision geophysical, electromechanical and electronic equipment.

Houston Technical Laboratories Acquires Texas Instruments

Confirming an earlier announcement of negotiations, J. E. Jonsson, president of Texas Instruments Incorporated, Dallas, has announced that Houston Technical Laboratories has been acquired by Texas Instruments Incorporated. P. E. Haggerty, executive vice president, and R. W. Olson, vice president, of Texas Instruments completed the final arrangements in Houston with Mr. Sam P. Worden, president of Houston Technical Laboratories.

Jonsson announced that 27,650 newly issued shares of TI stock have been exchanged for all the outstanding shares of Houston Technical Laboratories. The Houston company will continue in operation as a wholly owned subsidiary of Texas Instruments. R. W. Olson was elected president of Houston Technical Laboratories and will be responsible for its operation. Worden will remain with the company as vice president.

Houston Technical Laboratories manufactures gravity meters and special optical components primarily for the oil industry. This addition to the TI family—which includes Geophysical Service Inc. and several international exploration GSI affiliates and Engineering Supply Company of Dallas and Tulsa—will further broaden the scope of Texas Instruments activities.

Maurice Nicholls To Manage Kaiser Engineers in New York

Maurice Nicholls has assumed the duties of manager of the New York office of Kaiser Engineers. He has been transferred from the firm's Oakland, Calif., office where he had been consulting engineer and active in development work.

As manager of Kaiser Engineers' New York operation, Nicholls will be in charge of the development of engineering and construction projects for Kaiser Engineers in all fields of activity for the Eastern Seaboard area.

A graduate of the University of Michigan, Nicholls spent his early engineering career in marine engineering and design on the East Coast, England and Canada. From 1932 to 1937 he managed the New York office of the American Engineering Company.

Nicholls joined the Kaiser organization in 1939, when he became chief consulting engineer for all Kaiser shipbuilding projects. Transferred to New York in 1942, he was in charge of that office and served as liaison officer between the yards and the U. S. Maritime Commission.

Roberts Heads New Unit For Youngstown Sheet and Tube

Frank A. Roberts is manager of Organization Planning, a new unit in the Industrial Relations department of The Youngstown Sheet and Tube Company.

With headquarters in the company's general offices in Youngstown, Roberts is studying various departments to develop resources of managerial talent for the future.

After three years with Carnegie Steel, Roberts spent nine years with Trussed Concrete Steel Company and one year with Emerson Engineering Company, of New York and Pittsburgh. In October, 1916, he joined The Youngstown Sheet and Tube Company as an industrial engineer with the responsibility of organizing and building up the department.

From industrial engineer he advanced to assistant to the district superintendent and later became assistant to the Youngstown district manager. He held this post until his recent appointment to head the new department.

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More Footage at Lower Cost—

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Drilling Stems

with Forge Hammer-Welded, Fully Heat-Treated, Precision Machined Box and Pin Joints . . .

SPANG DRILLING STEMS are made of machine straightened special bar quality open hearth steel, of the right analysis to assure the greatest vibration dampening effect. Box and Pin joints are hammer-welded, fully heat-treated, and have precision machined threads to provide the strongest, most wear-resistant joints obtainable. As a result SPANG DRILLING STEMS, with high strength joints, give longer than average service and drill more footage at lower cost.

REPLACEMENT BOXES AND PINS

. . . of the same carbon steel analysis as those integral with original stems are available in all sizes, lengths and joint combinations for forge or electric welding to stems when renewal is required.

For complete information on Stems and Replacement Boxes and Pins, and for FREE CATALOG of other SPANG CABLE TOOLS, consult your nearest SPANG DEALER or write direct to:

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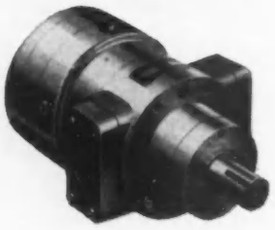
For over 60 years Manufacturers of Spang Weldless Jars and a Complete Line of Cable System Drilling and Fishing Tools for Oil and Gas Wells, Water Wells, Prospect Drilling and Shot Blast Holes.

Accurate within *inches* . . . TWO MILES DOWN

Hairbreadth control in positioning subsurface tools attained with

DENISON HydrOILic Equipment

Denison Axial-Piston HydrOILic Fluid Motors



Denison Axial-Piston HydrOILic Pump

Denison also makes vane-type hydraulic pumps and motors for all requirements to 2000 psi.

Reeling *miles* of wire cable in and out of oil and gas wells to control the position and action of Electric Pilot tools and Perfojet guns, calls for highly dependable equipment.

Great strides have been made in the efficiency of the services performed by organizations such as Dowell Incorporated, Tulsa, Oklahoma—one of whose modern Electric Pilot units is shown in action above, at a well near Midland, Texas.

The cable reel in this truck is powered by a 50 hp Denison Fluid Motor and a Denison Axial-Piston Hydraulic Pump. All operating components of the hydraulic system are compactly located beneath a seat in the truck. Through a single-lever directional control, Denison HydrOILic power permits the operator to raise and lower the tools rapidly or slowly, with smooth braking and inching action. An elaborate electronic control system helps the operator position the tools within inches of the desired depth, *thousands of feet below surface.*

Many types of Denison HydrOILic Pumps, Motors and Controls are meeting the most rugged and exacting demands encountered in the oil fields. You may also find the solution to your needs for equipment offering more widely and closely adjustable power and control, plus reduced size and complexity, in Denison's wide range of HydrOILic components for heavy-duty use at pressures up to 5000 psi. Please write for full details.

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Chicago 29, Illinois
Telephone: Reliance 5-7474

HOUSTON BRANCH
2501 Bartlett St.
Telephone: JUstin 6232
Houston 6, Texas

New Rental Supply Firm Begins Operations

A new firm in its field, Rental Pipe and Supply, has begun operations in the West Texas-New Mexico area. With offices in Dallas and warehouse and yard facilities at Hobbs, N. M., Rental Pipe and Supply is headed by William R. Gottshall, former manager of the Tubular Division, Continental Supply Company, a position he had held from 1949.

William R. Gottshall

Gottshall's experience in the oil industry covers a period of 17 years, one of which was spent as Chief of the Metals and Minerals Branch of the Petroleum Administration for Defense in Washington, D. C.

He joined Continental as a warehouseman in Shreveport, La., in 1936. After specialized training with Youngstown Sheet and Tube Company, Youngstown, Ohio, in 1939 and 1940, he assumed charge of Continental's tubular sales for the Ark-La-Tex area and Mississippi.

The new firm is engaged in supplying pipe, rotary tools and drilling and production equipment on a rental basis.

Vice president of the new firm is Charles F. Hawn, East Texas businessman. The board of directors includes Keith Peterson, Shreveport insurance executive; Jim R. Bower, Dallas oilman; J. Verne Hawn, Dallas homebuilder; W. A. Hawn, Jr., Athens automobile dealer, and N. O. Thomas, Jr., Shreveport realtor.

Dallas offices are located at 6478 Mimosa Lane. The Hobbs branch is located at 318 East Main Street.

Paul D. Sullivan Heads Le Roi Contractor Sales

Paul D. Sullivan has been named manager of contractor sales for the Construction and Mining Division of Le Roi Company. Sullivan will be responsible for Le Roi sales to large contractors throughout the continental United States. He will assist Le Roi dealers in selling problems.

Sullivan began his career with various railway, highway and dam projects in the Pacific Northwest. In 1928 he was associated with the Aluminum Company of America in North Carolina and Tennessee on its hydro-dam and electrification program.

Later he joined Clyde Equipment Company of Portland, Ore., as sales engineer and represented the company and other firms as specialist on heavy construction sales.

Oil Base, Inc. Moves Division Office to Houston

Oil Base, Inc. announces the moving of its Mid-Continent Division office from Fort Worth to Houston at 4614 Montrose Boulevard. A new control laboratory and additions to the plant at 8200 Market Street Road have recently been completed.

Personnel in the Houston office include A. K. (Deacon) Brown, division sales manager; Philip Renn, district manager for the Gulf Coast; and B. H. Burks, sales engineer.

WORLD OIL'S Trading Post CLASSIFIED ADVERTISING

RATES: Regular Classified (undisplayed) **set in this size type: 12 cents per word. Minimum charge, $3. Blind box address in our care counts six words. Replies forwarded without charge. Situation wanted ads, 6 cents per word. Display ads, set in suitably larger type with ruled border, $12 per column inch; situation wanted display ads, $6 per column inch. Ten percent discount for two or more insertions of same copy in consecutive issues. All classified ads payable in advance. COPY DEADLINE:** 5th of month preceding date of issue. **Send copy and checks to: Trading Post Section, World Oil, P. O. Box 2608, Houston, Texas.**

SITUATIONS WANTED

Drilling contractor operating in West Texas and New Mexico desires to contact small or medium-sized independent oil company who needs an operating manager. Personal interview desired. Twenty years experience in all phases of the oil industry. Address replies to Box 94-W, WORLD OIL, Houston 1, Texas.

HELP WANTED

Experienced Seismologists, Party Chiefs, Seismic Computers and Observers by major oil company. Seismologists will be permanently located in Mid-Continent Area. Applicants should have geological and/or geophysical background or at least five years practical experience. Give full details of education and experience in letter. Reply to World Oil, P. O. Box 14-W, Houston 1, Texas.

■ GEOLOGIST WANTED—Fast growing Mid-Western Independent (operating nation wide) needs petroleum geologist. Prefer recent graduate with some major company experience. Must be interested in new scientific survey methods and willing to study and promote program based on latest methods. Must be capable of organizing and directing geological department when required. Excellent ground-floor opportunity for right man. State age, education, experience, salary expected, and other details first letter. Replies strictly confidential. Box 11-W, c/o World Oil, Houston, Texas.

BUSINESS SERVICES

■ OIL LOCATING SERVICE! Documentary proof of success. Determine approximate depth and thickness of oil zones. Drilling locations pinpointed. NO OTHER GEOPHYSICAL WORK NEEDED! MOST SUCCESSFUL AND EFFICIENT method we know. YOUNG AND CRITCHLOW, 1975 N.W. Everett, Portland, Oregon.

Avoid drilling dry holes.
CARRILLO'S scientific electronic method for oil exploration is a direct technique that accurately locates oil deposits.
Twenty years of research, experience and success is our recommendation.
CARRILLO'S survey puts the drill on the oil.
For information or service, write to
CARRILLO, P. O. Box 9685, Station Sanford, Los Angeles 5, California.

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We are an established organization actively contacting the oil producing industry of Louisiana and East Texas on lines sold through Supply Stores. We are now in a position to do a good job on an additional line for this same market. If you want Sales Representatives that WORK for a living—call us.

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803 Maison Blanche Bldg.
New Orleans 16, Louisiana
Phone: Magnolia 7421

FOR SALE

■ **TWO 150 horsepower F and T boilers located at Eunice, New Mexico, Makin Drilling Co., Box 131, Hobbs, New Mexico.**

FOR SALE

USED, EXCELLENT CONDITION, IN OPERATION

On Each (4¾" to 1") (13⅜" to 4½") LANDIS Leadscrew Receding Head Pipe Threading and Cutting Machine Motor Driven. OILFIELD SALVAGE CO., NC. Phone CHarter 6914, P. O. Box 2589, Houston, Texas.

■ **FOR SALE:** U-15 rotary rig like new, including trailer house fully equipped. Wonderful buy. Available only because of health. Now drilling in West Texas. Inspect while in operation to get better idea. H. W. Sullivan, 611 Gulf States Bldg., Dallas 1, Texas.

FOR SALE 3500 TONS
PORTABLE STEEL IRVING GRID AIRFIELD OR ROAD MATS
Ideal on sand, dirt or mud
Will be sold in any quantities
Rail and Barge Shipping Facilities
ALTER CO.
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For Sale—PUMP & MOTOR

1—10" Fig. 6920, 10 stage, F-M turbine pump & 75 hp, 1800 rpm G.E. motor, 220V 35'—8" column, shaft & strainer 750 gpm capacity against 235' head.

SULLIVAN COUNTY WATER CO.
P. O. Box 325
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For Sale
Complete Compressor Station

Two 600 H.P. Type L.V.G. Ingersoll-Rand gas engines with high pressure compressors. Engines and compressors complete including Parkersburg Building. Located twenty miles from Houston. Contact Petroleum Management Company, 565 San Jacinto Building, Houston, Texas. Phone: CHarter 4781.

BUSINESS OPPORTUNITIES

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Consulting Geologist
SANTA FE, N. M. 113 W. Lupita — **AZTEC, N. M.** Field Office
Seeks oil or gas lease submittals for 1954 spring and summer drilling programs for reputable clients. Rocky Mountain Area. United States or Canada.
Other Inquiries Invited

■ Probably the best and one of the few remaining Avenues in America whereby a man can make a substantial profit and prevent the tax authorities from grabbing most of his earnings, can be found through the establishment of a Life Insurance Company. This method will permit you to establish, build and conserve your estate down through the years. If you possess the assets for creating a company, we possess the experience, knowledge, and Know How to do a successful job. Our record is successful and clean. Direct your reply to Box 12-W, c/o World Oil, Houston, Texas, and responsible men will deal direct with you in a confidential manner.

New Books, Maps and Movies

PUMPS, Second Edition, Frank A. Kristal and Fred A. Annett, McGraw-Hill Book Company, 327 West 41st Street, New York 36, N. Y. $6.50.

Covering pumps of many types and designs, this volume explains what kinds are available, how to select and install them, how to operate and maintain them, and how to locate and remedy pump troubles. Intended for use by designers, manufacturers sales representatives and operators, it discusses a wide range of pump applications, including boiler feed, paper stock, deep well, sewage and sludge, chemical, food product, oil field, gasoline line, fire and corrosive. Performance features of various types of pumps are explained, as are their service limitations, their construction features, materials used in manufacture, and the operations of particular types.

KEEP YOUR MUD IN BALANCE

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"Mud-O-Graf"

- Provides accurate information for uniform mud control.
- Helps prevent blowouts by showing the duration and relative amount of gas in gassy streaks.
- Eliminates guesswork in the use of weighting materials, chemicals, and water.
- Indicates graphically all heavy and light streaks in the circulating system.

The condition of mud in the hole is recorded automatically during every minute of the drilling operations. Weight variations of less than 1/10-pound per gallon can be detected. Mud-O-Graf has been proved in fourteen years tough field service. It eliminates trial and error methods of adding weighting materials. It detects gas or salt water incursions which could cause blowouts.

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Manufacturers of Pit-O-Graf and Rig Runner.

Houston	Odessa	Lake Charles	New Iberia	Harvey
CHarter 4444	6-5861	6-2265	2-7131	Edison 3721

Export Representative: International Oil Equipment Co.
30 Rockefeller Plaza, New York City

IRAQ OIL IN 1952, Iraq Petroleum Company, Ltd., 214 Oxford Street, London WI.

Iraq Petroleum Company, Basrah Petroleum Company and Mosul Petroleum Company have prepared a booklet reviewing the companies' operations in Iraq in 1952. This review has been published in Arabic as well as in English. Many color illustrations are used.

•

HANDBOOK OF ACCIDENT PREVENTION FOR BUSINESS AND INDUSTRY, National Safety Council, 425 N. Michigan Ave., Chicago 11, Ill.

This handbook shows how to set up and maintain a safety program. Detailed information is included on subjects such as plant layouts, materials, handling, housekeeping, machine guarding, electrical hazards, pressure vessel hazards, first aid, fire prevention and personal protective equipment. The 94-page handbook is illustrated and contains several check lists.

•

A SURVEY OF SECONDARY RECOVERY AND PRESSURE MAINTENANCE OPERATIONS IN TEXAS TO 1952, Texas Petroleum Research Committee, University of Texas, Petroleum Engineering Building, Austin, Texas. $1.

The Railroad Commission of Texas in conjunction with the Texas Petroleum Research Committee initiated a survey of secondary recovery and pressure maintenance operations in Texas in the spring of 1952. Data presented in the survey were obtained from the operators of the various injection projects throughout the state, supplemented by data on file with the Railroad Commission of Texas and from the technical and trade literature of the industry. The results of the survey are given in book form comprising 127 pages. The summary data for 254 injection projects are presented in tabular form and brief discussions of some 75 injection projects are presented with a more detailed discussion of ten major injection projects.

•

THE POWER OF GAS, C. V. Kirkpatrick, Camco, Inc., Houston, $5.

A complete manual on oil production by gas lift has been written by C. V. Kirkpatrick, professor of petroleum engineering, University of Houston.

Although the primary objective was the compilation of data on gas lift design practices, the manual covers many other matters. Basic gas law fundamentals and application; basic gas measurement practices and application, in addition to specific design problems and analysis regarding gas lift installations have been included. The total design problem has been emphasized. Specific procedure has been presented which will permit complete analysis of continuous flow, intermittent flow and borderline well installations so as to achieve maximum operating efficiency.

The manual has been copyrighted by Camco, Inc., Houston.

Steel Problems?

Call Jorgensen First

No matter how it's disguised, a steel problem can mean a struggle – but not if you call Jorgensen. It may be that you need a non-magnetic stainless steel such as 18-8, but haven't been able to get it because of government regulations. Now that all restrictions governing the use of nickel-bearing steel have been lifted, Jorgensen can supply *any* kind of steel for *any* application. Don't be drawn in the wrong direction – *CALL JORGENSEN FIRST!*

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WITH magnetic particle inspection by Western Inspection, you can detect minute flaws which cause pipe failures before you start a job. Our new equipment brings a high degree of accuracy to inspection services and a photographic record of the pipe's defects eliminates the chance for mistakes and gives positive, easily understood reports.

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"FOR WANT OF A NAIL . . ."

Kingdoms have been lost because of the lack of minute, special equipment at a critical time.

And so it can be in your business; packings or piston rings that do a specialized job can make the difference between maximum equipment performance or shut downs.

Let our engineers study your packing or piston ring problem and then recommend the right products for your needs.

Write for Complete Information

- Metallic Packings
- Power Piston Rings
- Carbon-Bakelite Liquid Pump & Compressor Piston Rings
- Valve Discs

FRANCE PACKING COMPANY
9925 Bustleton Ave., Philadelphia 15, Pa.

SQUEAKS from the BULLWHEEL

Wrong Ailment

A family in Germany was enjoying a special mushroom dish for supper. Suddenly they noticed the family cat under the table—mewing piteously and writhing in pain.

Papa, who just a few moments before had given the animal a taste of mushrooms, rushed the entire family to a hospital where all had their stomachs pumped.

Shaky from the ordeal, but grateful to the cat for the timely warning, they returned home. There was their benefactress, still under the table cuddling seven new kittens.

Trying to Be Helpful

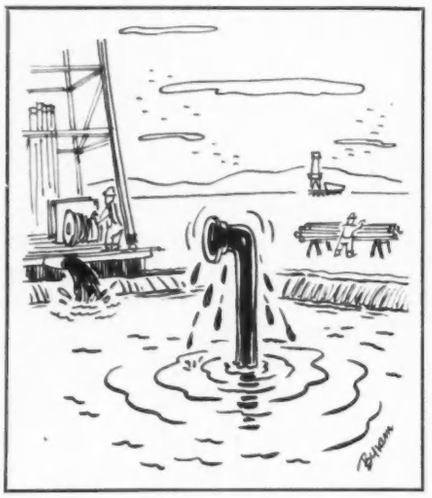
The teacher wrote on the blackboard: "I ain't had no fun all summer." Then she asked a small boy in the front row, "William, what should I do to correct that?"

"Maybe get a boy friend," he suggested helpfully.

Not So Dumb

A catalog sent out by a large mail-order firm found its way to an isolated farmhouse. In a few days the mail order people received a laboriously written letter asking about a farm implement.

A typewritten answer was promptly dispatched, to which came this aggrieved reply: "You don't need to print your letters to me. I can read writin'."



Overheard

"Little Mary, aged six, gazed long and earnestly at the beaming Marine who was making his first call on her Wave sister.

"May I sit on your knee, Mr. Marine?" she asked.

"Why certainly," enthused the flattered Marine. "I'll bet you want to play with my medals."

"No, no, it isn't that," replied little Mary, "I want to see if I can find that word."

"Word? What word?" asked the puzzled suitor.

"I heard sis say at dinner that if ever a man had the word 'idiot' written all over his face, that man was you."

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water cans and coolers

GOTKOOL WATER CAN
Made in 1½, 2, 3, 5, 10, 15 and 20 gallon sizes. Push-Button Faucet at slight additional cost.

KEEP PURE DRINKING WATER ALWAYS HANDY

GOTKOOL WATER COOLER
Made in 2, 3, 5, 8, 10, 15 and 20 gallon sizes with Push-Button Faucet.

GOTT Water Coolers are the convenient way to keep drinking water handy to the worker, protect it from impurities. Their exclusive construction keeps water cool for long periods. Snug-fitting, large, removable top, handy non-leaking push-button faucet. GOTT Water Cans for handy field use. Your supply store has them, get one today!

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Insist on the Genuine

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NEW SERVICES • NEW TOOLS
NEW WAYS OF DOING THINGS

Latest News About New Tools, Techniques and Services

BETTER RESULTS FROM PERFORATING

Improved M-3 and Glass Jet Perforators, plus record breaking efficiency, get MORE OIL in less rig time!

McCULLOUGH PERFORATING SERVICE

Improved money-saving, time-saving McCullough M-3 and Glass Jet Perforators get up to 25% deeper penetration—gain greater production through clean, uniform holes deep in the producing formation.

Look at this world's record for bullet perforating set by the M-3 Gun—7752 holes in 73 hours for a fine well. A very substantial saving in rig time.

Here's another example. A 154′ Glass Jet Perforator with Steel Strip Carrier was run on tubing and fired electrically to successfully perforate a high pressure gas well. One hundred twelve jets were fired over a total of four intervals covering an area of 149 feet. Total time on the job, including running the tubing—five hours.

. . . and when we say "more oil," here's the story of 18 wells that were reperforated by McCullough—production after completing with other methods—798 B/D; after reperforating by McCullough—3847 B/D; a production increase of 3049 B/D. These are only 18 of hundreds of similar cases.

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HUBER
ELIMINATE PARAFFIN

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If paraffin accumulation in pumping wells is your problem, it will pay you to get HUBER SCRAPERS—the only safe, sure method of *automatic* mechanical paraffin elimination.

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HUBER Universal Rod Rotators: they prolong coupling and barrel life by distributing wear equally.

HUBER No-Bolt Polished Rod Clamps: the *new* polished rod clamp with no bolts to tighten.

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SEE OUR CATALOG IN THE COMPOSITE CATALOG

—or write direct to:
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Box 831 Borger, Texas

Fishing?

Three men sat on a park bench. The man in the middle sat quietly, as though asleep, but the men on each side were going through the motions of fishing. With deadly seriousness they'd cast, jerk their lines gently and swiftly wind imaginary reels. A policeman sauntered over, shook the man in the middle and asked, "Are these two nuts your friends?"

"Yes, Officer."

"Well, get them out of here then."

"Right away, officer," said the man and began rowing vigorously."

•

These Englishmen!

A French diplomat was invited to the silver anniversary of an English bishop. "Silver wedding?" he asked the bishop's nephew. "It is a ceremony which I do not quite grasp."

"My aunt and uncle," was the reply, "have lived together for 25 years without being separated a single day."

"Ah," cried the Frenchman, "and now he marry her? Magnifique!"

•

Suprise Guest

A small boy visiting New York City for the first time went in an elevator to the top of the Empire State Building. As he shot past the 62nd floor at breath-taking speed, he gulped, turned to his father and asked, "Daddy, does God know we're coming?"

•

Definitions

"By golly," said the stranger at a dance, "what a long and lanky girl that is over there."

"Hush," his host whispered. "She used to be long and lanky—nowadays she's tall and stately. She just inherited half a million dollars."

Just Being Helpful

Suddenly he saw a driveless car rolling slowly down the street. Thinking quickly, he ran to the car, jumped in, and pulled on the emergency brake with a jerk. As he got out, feeling proud, a man walked up.

"Well," said the hero, "I stopped it."

"Yeah, I know. I was pushing it."

•

Society

Mrs. Newlyrich secured the services of a colored maid. After several days she noticed that the maid was taking home all the grapefruit skins. "Ruby," she said, "surely you don't eat those peelings?"

"No, ma'am," responded Ruby, "I takes 'em home because they sho do make my garbage look stylish."

•

Unknown Tongue

Boss: "What in the world happened to you? You're over an hour late getting home with those mules."

Hired Hand: "I know it, Boss, but I picked up Father O'Leary on my way home and from there on the mules couldn't understand a word I said."

•

Diagnosis

An old gentleman in the Midwest consulted a doctor about his heart. Every time he took a deep breath, said the patient, he could hear his heart squeak.

The doctor went over him carefully, but found nothing much amiss. But he did prescribe a bit of lubricating oil for a small pulley on the old gent's suspenders.

•

Good Excuse

A Washington executive excused himself from a meeting one afternoon with the explanation: "My mother-in-law is arriving on the four o'clock broom."

"Whoops! Lane-Wells on the job"

CONTRACT CORE IT WITH DIAMONDS

Hard or medium, deep or shallow, you'll recover more core at less cost (fewer trips) with Core Lab's Contract Diamond Coring. No bits to buy. No diamonds to inventory. No barrels and parts problems.

There's a cost-per-foot-cut price established for Core Lab's Contract Diamond Coring in virtually all active areas. (And for Core Analysis, too.) Just call the Core Lab man nearest you. He'll take it from there!

CORE LABORATORIES, INC. ● IN ALL ACTIVE AREAS

Dallas, Houston, Corpus Christi, Midland, Abilene, San Antonio, Tyler, Wichita Falls, Lubbock, Oklahoma City, Ft. Worth, Great Bend, Shreveport, Lafayette, New Orleans, Natchez, Bakersfield, Denver, Sterling, Worland, Williston, Billings, El Dorado, Farmington, Lovington, Calgary, Edmonton, Venezuela, S. A.

CORE LAB

from TARAWA to TEXAS— OKINAWA to OKLAHOMA !

MP straight centrifugal pumps have always been demanded for tough, exacting jobs. On beach-heads and in oil fields, MP pumps have proven they can take it.

- All Bronze Corrosion Resistant Construction.
- Continuous operation—wet or dry.
- Belt Drive from any power source.
- Right hand, left hand, or reversible rotation.
- Slotted Base Mountings.
- Capacities to 280 gpm. • Pipe Sizes ¾" to 2".

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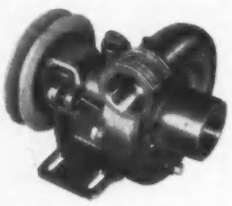
TRANSFER
COOLING
HEATING
FILLING



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"Now, don't be afraid to try to get a word in edgewise in these conferences, Son."

Overhaul Needed

A certain Western auto dealer sold two cars to the same man in one day. His customer was an Indian suddenly grown rich from oil which had spouted on his land.

The red-man bought a high-powered car, and with a gallon of gin in the front seat, fared forth to see the world. In about an hour, he came back bleeding and bruised, ready to buy another car.

"For heaven's sake, what happened?" the dealer inquired.

"Down road piece," said the Red man, "fences come fast. Telephone poles come fast. Soon bridges come down road. I turn to let go by. Need new car."

•

Good Scouts

The scoutmaster asked the four young scouts, "Have you all done your good deed for the day?"

They nodded in unison, grinning broadly.

"What did you do?" he asked.

"We helped an old lady across the street."

"It took all four of you to help one old lady across the street?"

"Yes. She didn't want to go."

•

Conclusion

And then there was the hen-pecked husband, whose wife gave him two neckties. He donned one and made a grand entrance for breakfast.

His wife took one look and snorted: "Hummph! So you didn't like the other one!"

•

Could Be Worse!

A wife, married to a hypnotist, brought her husband to court charging him with cruelty.

"Your worship," she complained, "my husband is the meanest man in the world; he hypnotized me into thinking I was a canary and gave me birdseed for breakfast, dinner and supper."

The magistrate gasped, "Is this true?"

The husband appeared very distraught. "I beg your pardon," he said, "but I don't think that was mean."

The magistrate's eyes popped. "You don't think that was mean?"

The husband shook his head. "No," he asserted. "I could have hypnotized her into thinking she was a sparrow and let her find her own food."

Off Schedule

A Scotsman, not feeling so well, called on the doctor, who looked him over and gave him some pills to be taken at bedtime. Whiskey was also prescribed, a small glass to be taken before each meal.

Five days later the patient called on the doctor, stating he was feeling no better.

"Have you taken the medicines exactly as I instructed?" the doctor inquired.

"Well, doctor," replied the patient. "I may be a wee bit behind wi' the pills, but I am six weeks ahead wi' the whiskey."

•

Take Your Choice

Irate wife: "I want an explanation, and I want the truth."

Husband: "Well, make up your mind; you can't have both."

•

Mind Reader

"Yes," said an energetic and effervescent young salesman, "I'm a mind reader. I can tell you exactly what you're thinking."

"In that case," said the purchasing agent, "I beg your pardon."

•

Generous

The conductor was perplexed. "Who on earth," he sputtered, "would want to steal a Pullman ladder?"

Just then the curtain parted and a little old lady poked her head through cautiously. "Conductor," she whispered, "you may use mine if you like. I won't need it until morning."

•

Wrong Key

An officer of ancient Rome was called away to the wars. Just before he left, he locked his beautiful young wife in armour and gave the key to his best friend with the admonition, "If I don't return within six months, use this key. To you, my true and loyal friend, I entrust it." He then galloped off to battle.

About ten miles from home, he saw a cloud of dust approaching from behind, and drew in his reins. Soon his trusted friend came dashing up, shouting, "Wait, you gave me the wrong key!"

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